# THE FARMERS' REGISTER.

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EDMUND RUFFIN, EDITOR AND PROPRIETOR.


For the Farmers' Register.

## ON THE AGRICULTURE OF FLORIDA.

*Importance and value of the sugar crop.*

*Wascissa, Florida, April* 12, 1836.

MR. EDITOR: The avocations of the planting season have so absorbed my attention, since my last letter, that I have had little leisure for writing. My crop being now, however, well "laid in," I avail of your favorable notice of my former communications, to send you, as promised in the conclusion of my essay, No. 4, "the details of my experience, as far as it has yet gone in this district of Florida, in the cultivation of cotton and sugar." The object of this exposition, being a comparative inquiry into the profits arising from these two valuable crops, and the *practicability* of their being here advantageously combined, must be my sufficient apology for its egotistical intrusion upon your readers. My first operations in planting, in this Territory, were begun in March, 1834. I commenced as prudence best dictated, in a "small way." The whole amount of capital invested did not exceed $12,000. The crop tended was 80 acres of cotton, 40 acres sugar-cane, and 60 acres corn and other provisions. The effective force consisted of 12 full hoe hands, and 4 boys, each with a mule and plough. I may here say that I had, at this time, newly arrived from the West Indies, and had located in the "Middle District", with the expectancy of establishing a sugar plantation; to the management of which I had been professionally bred. My greatest attention, therefore, was given, on this trial year, to the cane portion of my crop; which, to increase my labors, was entirely "rattoons," and had remained the previous winter, wholly unprotected and exposed. There were no "supplies" to be had, and the season of my commencement being late for planting, I felt no little anxiety for my "standing crop." I need not follow the details of my husbandry. I erected a *wooden mill*, with live-oak rollers, and calculated for four mules; and repaired roughly the dilapidated *log houses* which had the year previous served for the manufacture of sugar. The whole expenditure for these "make shift" requisites did not exceed $200.

The cane had a favorable season, and grew finely. At six months' age, it equalled in sweetness the West Indian cane of nine months; exhibiting therein the rapidity of Floridian vegetation, and the congenial heat of our summer for cane.

On the 24th October, "the day I well remember," there fell "a killing *frost*, that nipped me in the bud" of high and lofty expectation. Vegetation was by it destroyed; and the cane, "but yesterday," all green in rich luxuriance, now stood in the "sear and yellow leaf." I immediately began "cutting" and hurried preparations for manufacturing; in which the unprecedented earliness of the frost had found me dilatory. Indeed, I question whether the cane, injured severely as it was, could have been more taken unawares" by their *cold-hearted* destroyer, than I felt myself to be. I had not seen frost for ten years; and had not the least knowledge of its chemical action on the sugar cane. Guided, therefore, by the "usage of these parts," I persevered in boiling the cane juice, as rapidly as it could be expressed. For a week, I tried all my skill to granulate the juice; but with every addition of alkali, and all other "means and appliances to boot," which my experience could suggest, my labor was fruitless. Excess of boiling, with an excess of lime and alum, brought the juice to the consistency of paste, without the semblance of crystallization—tough and stringey. Without alkali, it burnt in syrup. I at once changed my operations, and, with a loss of near 15 acres of my cane, I ceased "boiling" and commenced "mattressing" in the field. This is a technical term, expressive of the mode practiced in Louisiana, of securing the cane against frost, and is intended when *rightly done*, to be done before the frost strikes the vegetation. Unfortunately, I had neglected the *premonitory* system; and had nothing left but mere experiment. I cut down the cane close to the ground,(digging it up with a hoe, by the roots is more advisable,) and threw three rows in one, in "wind rows," across the field, taking care to place the foliage of one stool of cane over the *buts* of the previous one; thus laying them to the height of three to four feet like a *thatched* roof. I allowed three weeks to elapse before disturbing the "mattresses," during which time, the weather was alternately cold with frost, and warm with rains. On the 20th of November, or thereabouts, I again began "grinding." To my surprise, the saccharometer exhibited an increase of two degrees, it having held only seven in October, and now gave nine. I had no longer difficulty: the sugar appeared in "character distinct," with a large, firm, and sparkling grain. The juice had become darkened in color, *almost black*, but that was easily corrected; its yield was at times, as we expressed the finer canes, fully a *pound of raw sugar to the gallon of raw juice*. I never used more than eight ounces of lime to the 100 gallons of juice. I am particular in giving you this *history* of my original proceedings; for others may, therefrom, gather experience; and, as it establishes *the fact, in my mind*, that "mattressing" the cane *for a limited* period, even after the frost, so far from injuring its return, will in this climate *increase it*. I can only account for it, in the supposition that, by evaporation, the solid juices become concentrated; and from the warmth generated by "mattressing," acquire viscidity and sweetness; and which, if not continued too long, increases the yield of sugar, but, if allowed to remain indiscreetly, would as certainly generate acetous acid, and fermentation. If this supposition be correct, it only requires to be firmly established, and generally known, to render a combination of sugar and cotton, in this district, not only a feasible crop; but, under all seasons, a certain and profitable one: and, I should be much pleased, Mr. Editor, to receive your chemical opi-

nion on this important question.* The *results* of my crop above stated, under all the disadvantages of "rot" in the cotton, that destroyed nearly one-fourth after "bolling;" and the loss in the cane, from premature manufacture, and effects of frost, were as follows:

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| 52 bags cotton at 16½ cents, - | $2,831 40 |
| 63 barrels sugar, (from 26 acres,) at 10 cents, - - - - | 1,323 00 |
| 51 barrels molasses and syrup, at 30 cents, - - - - | 459 00 |
| 180 gallons common rum, at 50 cents, | 90 00 |
| 800 bushels corn, at 50 cents, - - | 400 00 |
| Total, - - - | $5,103 40 |
| Deduct expenses of negroes, including rent of land, - - | 1,600 00 |
| Nett product of 14 laborers, - | $3,503 40 |

*Our correspondent attaches much more importance than is due to our opinions on vegetable chemistry; but being thus called on, we will state our impression. It cannot be, (as he suggests,) that the concentration of the saccharine juice can cause its yield to be greater; but the other supposition may well be correct, that the process of "mattressing," by generating and maintaining a greater degree of heat, may produce chemical changes in the juices of the canes, and actually increase the quantity of sugar. All the different matters which form vegetables, as sugar, starch, mucilage, wax, oil, &c., are each composed of the same three elementary bodies, viz. oxygen, hydrogen, and carbon, merely varied in their proportions. Of course, each of these many substances could, by a slight change of its quantities, in nature's laboratory, be changed to any other. Even art can effectually produce some of these changes. Thus, chemistry has shown the certain means of converting starch into sugar; but at a cost too great for economical purposes. The slightest observer may know, that nature is working similar changes throughout the whole course of vegetable life. For example: the saccharine juice is formed abundantly in the stalks of growing Indian corn, and the sugar increases faster than the bulk of the plant, nearly to the time of the maturing of the grain. But, about that time, the sweetness of the pith is lost, by the sugar being entirely converted to some other vegetable substance—and probably to furnish starch, which, forms so large a portion of the grain. Now, as nature in this case, changes sugar to starch (or something else,) so the increase and maintenance of heat in sugar canes may change starch, mucilage, &c., to sugar; and this change is the more likely, as, in a climate sufficently warm, the successful effort of nature, at that period of the growth, is to increase the proportion of sugar in the plants; and that increase, of course, is effected by changing other existing vegetable products to sugar. When nature is making an effort to produce a certain chemical change, (which, however, may be thwarted or enfeebled by climate or other adverse circumstances,) it is not difficult to contrive artificial means for aiding that effort, and thereby giving it full effect; and such seems to be the operation and effect of "mattressing."—ED. FAR. REG.

This crop, it must be remembered, was made in *nine months*—as I did not take possession of the land till the end of March, and was obliged to relinquish it at Christmas. I lost, therefore, a large proportion of the "refuse" of my mill; which, had time allowed, could have been profitably converted into rum. And here I would say that no one should attempt the profitable cultivation of sugar-cane, in this Territory, without first having an efficient and complete distillery. I look upon the "still-house" as being here of decidedly greater value and necessity than even the sugar-boiling apparatus. With a proper arrangement of stills, there can be no total loss sustained in the cane crop; for even should frost strike it to acidity, spirit can be extracted; and it will require a vast incease of Temperance Societies, before that *stimulant* becomes valueless.

In the West Indies, on well managed estates, the rum and molassses pay all expenses of manufacture of the sugar; and not only could it be done in Florida, but leave also, from the higher home use of spirit and molasses, a handsome revenue.

My operations for 1836 were solely in cotton. Many reasons, (exclusive of my desire to try a cotton crop alone,) here unnecessary to detail, caused me for the time being to relinquish the "higher game" of sugar. I purchased this estate, "Wascissa," and worked 36 hands. My crop had not yet been sold; but it certainly will nett me more per head than last year's "combination," owing however to the present high value of cotton; and this is the reason why so many of our cotton planters have realized this year such extravagant wages from their negroes—some even as high as $600, per head, average. Yes! Mr. Editor, I have it from unquestionable men, that our fellow-citizen, Mr. Green Chawes, has sold cotton, made last year by 22 laborors, exceeding, (with corn,) $13,000. But yet I do not yield determined preference for cotton. As long as the demand will give 20 cents, or even 15 cents, per pound, it is undoubtedly a money-making culture, and sufficiently so to annihilate any other substitute; and even at 10 cents per pound, it is unquestionably a more expedient entire crop than sugar; and no prudent man will, under any circumstances, in my opinion, here, attempt a sole crop of sugar: its results must and will be, nine times in ten, complete ruin. I advocate only sugar in combination with cotton; and I conceive that if it can be shown not only practicable in this climate, but profitable, that I am "doing good unto many," and especially advancing, in such event, incontestible proof that our Florida lands are, (as I have before stated in a former letter,) "the cheapest in the southern country." To expose clearly my reasoning, let us instance an estate, first, with cotton alone; secondly, with cotton and sugar combined; and, lastly, with sugar by itself. We must, in this comparison, reduce our calculation to "dollars and cents;" that method of reasoning being, as it were, innate in all planting readers, and, to do so fairly, we must take the staples at a fair average value. Say—cotton 10 cents per pound, and sugar 10 cents per pound.

### *Instance First.*

B has a plantation of choice land, well located,

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| and under skilful management, consisting of 500 acres of open land, cost, - | $10,000 |
| His effective force are 50 hands—cost, | 30,000 |
| And, 15 mules, with plough-gearing, &c. cost, - - - - - | 1,500 |
| His gin-house and machinery, cost, - | 500 |
| Thus, with a capital invested of - | $42,000 |

B commences his cotton crop. The whole 500 acres being well cultivated, shall yield him the maximum average of 1000 pounds raw cotton per acre, making, gross, 500,000 pounds cotton as the saved crop. Now, it is a minimum calculation to allow only three-fourths loss by ginning, &c. To be fair, we however, will now allow it. 500,000 pounds raw cotton will, therefore, give 125,000 pounds of clean cotton, fit for market.

| | |
|---|---|
| B sells, as his crop, 125,000 pounds cotton at ten cents, - - - | $12,500 |
| Deduct expense of negroes, cost of bags, &c., - - - - - - | 2,500 |
| Leaves him about 24 per cent. gain on invested capital, or - - | $10,000 |

Is this not a fair calculation? and does it not show a very profitable investment? Let us proceed, however, to our second instance, viz. cotton and sugar combined.

*Second.*

| | |
|---|---|
| D. has an estate like B., both in land, and effective laborers. It is worth the same, | $40,000 |
| D having an intention to make sugar, has outlaid in mules, and extra requisite machinery, - - | 5,000 |
| Thus, with an invested capital of | $45,000 |

D. begins planting: he plants 400 acres cotton, and the remaining 100 acres of his land, in sugar cane, being the largest proportion of cane, his knowledge of the climate, and the efficiency of his laborers can permit him to make: he has the same seasons as B, and his cotton yields him the same per acre, viz. 1000 pounds. The season for cane is an average one; and there being more risk in climate for its success, than for cotton, we will not take the average yield in Louisiana for the cane, (though strictly it would be but just,) but assume that D has to mattress his cane, to save it from frost. On grinding it, it will still yield him 1000 gallons of juice per acre, which is equal, under all circumstances, to 500 pounds of sugar. (In Louisiana, 100 pounds of sugar, per acre, is an average yield; in the West Indies from 3000 to 6000 pounds: admitting, however, every uncertainty of the climate, and the hurry of manufacture, D's crop will turn him out as follows: viz.

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|---|---|
| 400,000 pounds raw cotton equal to 100,000, clean, at 10 cents, - | $10 000 |
| 100 acres cane at 500 pounds per acre; 50,000 pounds sugar at 10 cents, - | 5,000 |
| 50,000 pounds of sugar will drain at least 4000 gallons molasses, - | 1,200 |
| And the "scummings and refuse" of the mill will, with washings of sugar and molasses cisterns, return by distillation, a barrel of rum for every hogshead of sugar; i. e., 1,800 gallons spirit for 50 hogsheads | 1,350 |
| Total proceeds of crop - - - | $17,500 |
| Deduct same average expense as before for negroes, &c., 2,500, and add thereto, for extra expenses, attending the manufacture of sugar, $500 - - - | 3000 |
| Leaves D. nearly 33 per cent. gain, or | $14,550 |

The above I hold to be a very moderate estimate on the sugar cane, and it evinces my desire to give the cotton every allowable advantage in the estimate by my giving 1000 pounds per acre of that staple, and only 500 pounds of sugar. I do not myself question the practicability of the above combination, and that it is profitable, is there shown in the accuracy of figures. That it has not yet been attempted here, has been owing, originally, to the limited capitals of our first settlers, the want of the requisite practical knowledge and efficient machinery; and, lastly, to the *monomania* which the rise of cotton has created. The failure, likewise, heretofore, when sugar mania ran as wild as cotton bigotry does now, of those experimentalists, who imprudently ventured their all on sugar, has caused the very mention of the staple to be considered synonymous with "loss;" and enough to rank its advocate as another of the "visionary theorists." This does not present my impartial consideration of the matter; and should not deter a right view of the subject, merely because we have only, as yet, the errors and failures of others to attract our attention. That because an entire crop of cane is here, at all times, hazardous, and most often ruinous, does it necessarily follow that the plant, *sui generis*, is impoverishing, and, with all its luxuriance, unprofitable? The season for manufacture may not admit of the saving of 500 acres of cane; but it assuredly will admit of 100 acres being profitably saved, with 50 effective hands, and requisite machinery; and that too, without any serious sacrifice of cotton, or great loss of labor. It is erroneous, as is here generally believed, that the manufacture of a sugar crop will essentially interfere with, and diminish the cotton crop. In the proportions of one-fifth cane, there can be no such interference—admitting that the earliness and severity of frost, is such as to compel the immediate service of all your laborers to the security of the cane. Your 50 hands will mattress it, (100 acres,) in three to five days—where it may lie for a month. Half your force, with tried machinery, will then manufacture it in a fortnight, without any extra labor; and your other remaining half of laborers will certainly, at that season, save all the cotton that is liable to fall. It is not, however, one year in ten, that the season would compel this entire disposition of your laborers; and certainly your chance of revenue from two crops, not liable to the same disasters, (for none can deny that the cotton plant has nearly as many risks to run before its fruit is saved, as the cane,) is more than equivalent to a moderate loss, by a heavy blow of cotton. No one should attempt the cane cultivation as a source of revenue, with a less force than 50 effective hands; and I attribute the heretofore failures of sugar here, in a great measure, to over-

cropping, and a poverty of laborers. I need not further extend this already attenuated letter. The exposition of my third "instance" in sugar alone, may be left as it is. Sufficient will be gathered from the foregoing remarks, that I disapprove, under the liabilities of our climate, the risk of an entire sugar crop; and it not being the purpose of these "inquiries," to exaggerate, or enhance the really existing advantages of our climate, by any Quixotic operations, the results of an entire cane crop, may certainly be considered as dubious, or in ratio with the sanguine temperament of its advocate.

I am fully aware, that the force of theory, even when established by individual success, cannot controvert the universal belief of "uncertainty;" and whenever the disposition of men are confident of gain in one line, but diffident of their skill in another, no other reasoning can convert them, save interest and necessity. It will, therefore, need that cotton should decline, (as it most assuredly must,) below 10 cents, before our cotton fatuists can be severed from their affection. To those abroad, however, not yet infatuated, whose attentions may be inclining to a southern residence, I feel assured that my remarks will be estimated, (as they really are,) as the candid expositions and belief of one, in as far as another's fortune may be concerned, perfectly disinterested. I cannot but conceive it inexplicable, that, whilst all are intently watching the probable rise and fall of the cotton market, with the universal knowledge that its culture and product are annually and amazingly increasing, and to continue until the vast area of the south and west are no longer fertile; that the certain scarcity of sugar, and its as certain great demand, does not bring the mind to the reflection of the fact, that its culture is rapidly decreasing, and the lands acclimated for its production, extremely limited, and not to be extended. How peculiarly is this the case with this portion of North America! The time must come, when, with all its fluctuations of climate, Florida will be the sugar-growing section of these United States.

With the assurance of my acknowledgments for your favorable acceptance of my past communications,

I am, your obliged and obedient,

FARQ. MACRAE.

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## QUERIES ON POLITICAL ECONOMY, AS CONNECTED WITH AGRICULTURE.

**To the Editor of the Farmers' Register.**

Though I am no farmer, and no subscriber to your work, I yet consider it of great public benefit, and should rejoice to see it circulate even more extensively than it now does. Permit me to suggest one or two thoughts which have occurred to me, in looking over some of your late numbers.

In your last, Vol. III. No. 12. page 757, you say that the universal tendency of all legal inspections of the qualities of commodities, is to deteriorate their quality—and of course, their market price. Was this assertion well weighed? Is it true? The subject is so important to our commerce, and yet more to our agriculture, that if it be true, our law makers ought to know it. As the chancery lawyers say I "neither admit nor deny the allegation," as it is not within my knowledge—but call on you for proof.

Again—you frequently speak of poor-laws as being of unquestioned evil effect, and refer to England for proof. Are not the population of England, even drown to the lowest laborers, better off than the like classes on the European continent? Are they not better off than their fellows in Ireland? Do not even the English whigs, (whom I believe to be of the same school with yourself in political economy,) propose to introduce that system into Ireland? I would say to you as the editor of the Enquirer says to his opponents, "give us light." Or will your correspondent Mr. Walker, give his light on these last points? As a native Briton he has seen the practical workings of the system, and in this age of repetition, and borrowing, and plagiarism, it is very pleasant to meet with the opinions of a thinker and writer so original as he, even though we should not entirely agree with him.

Important topics as slavery and the management and treatment of slaves are to agriculturists of the south, it seems that few of the intelligent gentlemen who send their contributions to the Register, have thought proper to discuss any question connected with this class of our population. Is not this unwise? Delicate as this subject is in many respects, there are some of its features, concerning which, an interchange of opinions would be advantageous, and, as I suppose could be carried on, through such a medium as your magazine, without giving offence to the most sensitive. An article on the profits of rearing slaves, which you once published, affords one example of the class of subjects to which I allude. Are your columns open for prudent discussions, or inquiries on these subjects, from loyal Virginians, or inhabitants of other southern states?

You frequently urge your readers to become writers, and furnish you with original matter. Many would perhaps do this, if their minds were directed to particular points on which information is specially desirable. Would it not be well for you to publish queries, to which your contributors might furnish answers, or to suggest particular subject, concerning which, you especially desired information?

A. B.

[Our correspondent's suggestions it is hoped, will not pass unheeded, nor fail to elicit some communications from other correspondents, of interest and value. To *others* we would prefer to give place, in treating either, or all the subjects proposed. With regard to the ill policy of legal inspections of the quality of commodities, our opinion has long been fixed—and if time permitted, and the occasion required, we would not fear to attempt the maintenance of our position by argument, and by facts. But we certainly should have no hope of convincing, or even of attracting the notice of "our law-makers," as a body. Our opinion is not less decided, as to the impolicy and ill effects of the general operation of the poor-law system, both in England, and this country—and there is no branch of political economy, more closely connected with the interests of agriculture, or more suitable to be disussed in an agricultural journal. But we confess our inability to treat properly and fully, so wide a subject—or to compress within suitable and proper limits, even the

imperfect lights which we have: and therefore, would greatly prefer, that the task should be undertaken by another.

Slavery, and the management of slaves, as connected with our agriculture and domestic economy, are certainly proper subjects to be discussed in this journal. To deny that position would be almost as absurd, as to omit in such a journal, all reference to the improvement of land—for in the southern states, the agricultural capital vested in slaves, and the products derived, directly or indirectly, from the labor, are scarcely inferior, in value and importance, to the capital in, and products from, land alone. Still in these distempered times, when there is so much madness and folly afloat, on the general subject of slavery—so much fanaticism in the north, on one side of the question, and not a little in the south, on the other side, discussion on this subject is rendered difficult to regulate, and to restrain within proper limits,—and therefore would require much caution and self-restraint on the part of all who may undertake to treat on slavery.

With regard to the insertion of queries, if our correspondent had been longer acquainted with this journal, he would have known, that the practice which he recommends, has been adopted to considerable extent: but it is to be regretted, that there are fewer answers than questions. If every difficulty were stated in the form of a query—and every person who possessed the information wanted, would promptly furnish it in answer, that plan of mutual accommodation and instruction, alone, would make the journal which was the channel of such intercourse, of incalculable value to farmers, and to the improvement of agriculture in general. That simple means alone, fully carried into operation, would give to each reader the benefit of the lights of all others—and would make the journal a general "intelligence office," where any kind of existing information could be obtained, by merely asking for it.]

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## HIGHLANDS INJURED BY WATER.

To the Editor of the Farmers' Register.

*Wardsfork, Charlotte.*

I have appeared so often on your pages of late, I judge I shall be charged by some of your readers with being urged by an itch for scribbling. I acknowledge it is a disease to which I am a little subject—but really I think, there is more apology for those who labor under this pen-complaint, than those who seems to be possessed by an uncommunicating devil, who will write nothing for fear of being charged with vanity. For my part, I think this morbid sensitiveness, in some instances indicates the very highest degree of vanity, that cloaked under the garb of humility. I am acquainted with some of our best practical farmers; who, if they could be induced to publish, might be of much service to our agricultural interest. But enough of this.

Much has been said about the injury done to lowlands, by water: but little notice has been taken of the bad effects of excessive wet, on high lands. Indeed it is scarcely thought that highlands are injured by wet, except those soils that are called springy. But all soils I think, are rendered less productive by remaining level, while exposed to the drenching rains of winter. Whether this is owing to some mechanical or chemical changes, I have not determined by experiment: for I make but few experiments of any sort. Having constantly before me Nature's great laboratory, if I can so speak,—I watch her operations and results, and collect facts in a way more agreeable to myself and my employments as a farmer. For while I was making in-door experiments on soils, I am sure the practice would be bad without. I generally place myself in a situation, that while I am learning from Nature, I can take a peep at Cuffee, and the overseer, and see that they are practicing, while I am contemplating. I am quite sure if I were often engaged in making small in-door experiments, and it was known to the *slip-gap fraternity* of our parts, there would be very fatal results to my corn field.

But to the subject: I have noticed that those spots of highland which have kept wettest from their being so situated as to collect and retain excessive moisture, are sure to fail in making a satisfactory "turn-out," particularly in wheat; while on the other hand, the driest and most elevated portions, more than fulfil their promise. I have noticed two concave surfaces, containing about a half acre each, in which the rain-water gathered, and kept "sobbed" during winter; but, would become dry enough (aye, too dry—for it is of all earth the dryest in summer,) to induce an attempt at cultivation with the rest of the field—but which, uniformly failed to produce. It is a little curious to see how lively and light the soil of ditch-banks, and other elevations looks in the spring, compared with the adjacent level places, and how much quicker it moves vegetation. I have observed that hill-sides from which the water most readily escapes, will produce best, agreeably to the fertility. sloopes are better than entire levels, for the same reason. I will here observe, though from the point, that our lowlands even where it has been attempted, are generally not more than half drained. I never saw but one perfectly drained piece of lowgrounds, a piece of John F. Edmunds', of Wardsfork. It is made perfectly free from any degree of "sobbing," winter or summer, by the most skilful ditching, and the heaviest crop of corn I ever saw any where, it yielded last season. But to the highland, the practice which my view of the subject suggests is quite plain. Place the land for cultivation as near as you can in that situation, which nature has placed the most productive spots, viz: in a situation that will preserve it from the least sobbing from winter rains. For this purpose, I would recommend all uplands to be left in beds, and particularly for wheat. Where soil is naturally of a wet character, as some of our highlands are from their level situation, or from a bad clay, it is greatly improved by ditching.

I. R.

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From the British Farmer's Magazine.

## AGRICULTURE IN FLANDERS.

It is a pleasure to observe the laborious industry of the Flemish farmer, recruited by intervals of comfortable and decent refreshment; and not less agreeable to perceive the farm servants treated

with kindness and respect; and who uniformly dine with the farmer and his family. In Flanders the gentlemen are all farmers, but the farmes do not aspire to be gentlemen, and their servants feel the benefit. They partake with them a plentiful and orderly meal, which varies according to circumstances. The laborer is in general very well able to support himself by his work; in a country where so much manual labor is required in weeding, the laborer's family is occupied pretty constantly in summer; and in winter they spin. Each day-laborer has, in most cases, a small quantity of land, from a rood to half an acre, for his own cultivation. In common times, a begger is scarcely to be seen, except in the towns, and but few there. In the country, habits of industry are kept up till health fails; and to meet the infirmities of age, the poor possess a revenue from pious donations, regulated by the government, and vested by them in commissions, of which the mayors of the different communes are presidents respectively, in right of their office. The Flemish farmer seldom amasses riches, but is rarely afflicted with poverty: industry and frugality are his characterstics; he never looks beyond the enjoyment of moderate comforts; abstains from spirituous liquors, however easily to be procured; never exceeds his means; pays his rent punctually, and in case of emergency, has always somewhat to command beyond his necessary disbursements. This is effected too upon a soil naturally the reverse of rich; and, in fact, a bad soil. Yet such is the effect of industry, sobriety, and skill, that there are about five souls to eight English acres. Notwithstanding this, one-third of the produce of the land is annually exported!—than which no circumstance can better mark the skill, the industry, and the frugality of the Flemish farmer. In England, Sadler says there are about ten souls to every twenty acres. In Ireland, thirty acres to ten persons. What will the Malthusians and emigrationists say to this, who recommended the transportation of our surplus hands, and, of course, of our best and most efficient laborers! The soil of Flanders, far inferior to our own, can sustain twice the amount of human existence. The secret of this is, that the work is done by the spade and hoe. The farms are all small, though "rent and taxes" are heavy; but the farmers and laborers are sober, skilful, industrious, and frugal.

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### SALE OF FINE CATTLE.

The following is an account of sales made in Philadelphia, by Mr. John Hare Powell, of his fine Durham cattle:

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|---|---|
| A poor bull calf, 4 weeks old, sold for - | $120 |
| Cow No. 1, - - - - - - | 600 |
| Cow No. 2, - - - - - - | 650 |
| Cow No. 3, - - - - - - | 510 |
| Cow No. 4, - - - - - - | 560 |
| A calf, No. 5, - - - - - | 300 |
| Bertram, No. 6, - - - - - | 500 |
| Do. No. 7, - - - - - - | 480 |
| The lowest cow sold for, - - - | 155 |

Mr. Powell's Durhams brought higher prices than the stock cattle of the late Jeptha D. Garrard, sold on the the 8th, at Cincinnati. The finest two year old heifer, went off for $575, a heifer, one year old, for $510; a full-blooded Durham bull, 2 years old, for $465, &c. &c.

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### SOME NOTICE OF THE PRIVATE LIFE OF THE MARQUIS DE TOURBILLY.

*Extract from Young's Travels in France.*

[The readers of the account of the labors and improvements of M. Turbilly, which was re-published in the last two numbers of this journal, will perhaps be gratified with the following statements and remarks of Arthur Young. Though few will feel any thing of enthusiastic admiration expressed by Young; many may feel some interest in the private history and fortunes of a man, who like most others of the class of agricultural improvers, labored much more successfully to promote the public interests, than his own.]

* * * * Letters from Mons. de Broussonet; but he is unable to inform me in what part of Anjou was the residence of the marquis de Tourbilly; to find out that nobleman's farm, where he made those admirable improvements, which he describes in the *Memoire sur les defrichemens*, was such an object to me, that I was determined to go to the place, let the distance out of my way be what it might. * * * * *

My first business here, as everywhere else in Anjou, was to enquire for the residence of the marquis de Tourbilly. I repeated my enquiries till I found that that there was a place not far from La Flêche, called Tourbilly, but not what I wanted, as there was no Mons. de Tourbilly there, but a marquis de Galway, who inherited Tourbilly from his father. This perplexed me more and more; and I renewed my enquiries with so much eagerness, that several people, I believe, thought me half mad. At last I met with an ancient lady who solved my difficulty; she informed me, that Tourbilly, about twelve miles from La Flêche, was the place I was in search of: that it belonged to the marquis of that name, who had written some books she believed; that he died twenty years ago, insolvent; that the father of the present marquis de Galway bought the estate. This was sufficient for my purpose; I determined to take a guide the next morning, and, as I could not visit the marquis, at least see the remains of his improvements. The news, however, that he died insolvent, hurt me very much; it was a bad commentary on his book, and I foresaw that whoever I should find at Tourbilly, would be full of ridicule of a husbandry that proved the loss of the estate on which it was practised.

The 29th. This morning I executed my project; my guide was a countryman with a good pair of legs, who conducted me across a range of such ling wastes as the marquis speaks of in his memoir. They appear boundless here; and I was told that I could travel many, many days, and see nothing else: what fields of improvement to make, not to lose estates! At last we arrived at Tourbilly, a poor village, of a few scattered houses, in a vale between two rising grounds, which are yet heath and waste; the chateau in the midst, with plantations of fine poplars leading to it. I cannot easily express the anxious inquisitive curiosity I felt to examine every scrap of the

estate; no hedge or tree, no bush but what was interesting to me. I had read the translation of the marquis's history of his improvements in Mr. Mills' Husbandry, and thought it the most interesting morsel I had met with, long before I procured the original *Memoire sur les defrichemens;* and determined, that if ever I should go to France, to view improvements, the recital of which had given me such pleasure. I had neither letter nor introduction to the present owner, the marquis de Galway. I therefore stated to him the plain fact, that I had read Mons. de Tourbilly's book with so much pleasure, that I wished much to view the improvements described in it; he answered me directly in good English, received me with such cordiality of politeness, and such expressions of regard for the purport of my travels, that he put me perfectly in humor with myself, and consequently with all around me. He ordered breakfast *a l' Anglaise;* gave orders for a man to attend us in our walk, who I desired might be the oldest laborer to be found of the late marquis de Tourbilly's. I was pleased to hear that one was alive who had worked with him from the beginning of his improvements. At breakfast Mons. de Galway gave me an account of his father's acquiring the estate and chateau of Tourbilly. His great-grand-father came to Bretagne with King James II. when he fled from the English throne; some of the same family are still living in the country of Cork, particularly at Lotta. His father was famous in that province for his skill in agriculture; and, as a reward for an improvement he had wrought on the *landes*, the states of the province gave him a waste tract in the island of Belleisle, which at present belongs to his son. Hearing that the marquis de Tourbilly was totally ruined, and his estates in Anjou to be sold by the creditors, he viewed them, and finding the land very improveable, made the purchase, giving about 15,000 louis d'ors for Tourbilly, a price which made the acquisition highly advantagous, notwithstanding his having bought some law-suits with the estate. It is about 3000 arpents, nearly contiguous, the seigneury of two parishes, with the *haute justice*, &c. a handsome, large, and convenient chateau, offices very complete, and many plantations, the work of the celebrated man concerning whom my inquiries were directed. I was almost breathless on the question of so great an improver being ruined! "You are unhappy that a man should be ruined by an art you love so much." Precisely so. But he eased me in a moment, by adding, that if the marquis had done nothing but farm and improve, he had never been ruined. One day, as he was boring to find marl, his ill stars discovered a vein of earth, perfectly white, which on trial did not effervesce with acids. It struck him as an acquisition for porcelain—he shewed it to a manufacturer—it was pronounced excellent: the marquis's imagination took fire, and he thought of converting the poor village of Tourbilly into a town, by a fabric of China. He went to work on his own account—raised buildings—and got together all that was necessary, except skill and capital. In fine, he made good porcelain, was cheated by his agents, and people, and at last ruined. A soap manufactory, which he established also, as well as some law-suits relative to other estates, had their share in causing his misfortunes; his creditors seized the estate, but permitted him to administer it till his death, when it was sold. The only part of the tale that lessened my regret was, that, though married, he left no family; so that his ashes will sleep in peace, without his memory being reviled by an indigent posterity. His ancestors acquired the estate by marriage in the fourteenth century. His agricultaral improvements, Mons. Galway observed, certainly did not hurt him; they were not well done, nor well supported by himself, but they rendered the estate more valuable; and he never heard that they had brought him into any difficulties. I cannot but observe here, that there seems a fatality to attend country gentlemen whenever they attempt trade or manufacture. In England I never knew a man of landed property, with the education and habits of landed property, attempt either, but they were infallibly ruined; or if not ruined, confidently hurt by them. Whether it is that the ideas and principles of trade have something in them repugnant to the sentiments which *ought* to flow from education—or whether the the habitual inattention of country gentlemen to small gains and savings, which are the soul of trade, renders their success impossible; to whatever it may be owing, the fact is such, not one in a million succeeds. Agriculture, in the improvement of their estates, is the only proper and legitimate sphere of their industry; and though ignorance renders this sometimes dangerous, yet they can with safety attempt no other. The old laborer, whose name is Piron, (as propitious I hope to farming as to wit,) being arrived, we sallied forth to tread what to me was a sort of classic ground. I thall dwell but little on the particulars: they make a much better figure in the *Memoire sur les defrichemens* than at Tourbilly; the meadows, even near the chateau, are yet very rough; the general features are rough: but the alleys of poplars, of which he speaks in the memoir, are nobly grown indeed, and do credit to his memory; they are 60 or 70 feet high, and girt a foot: the willows are equal. Why were they not oak? to have transmitted to the farming travellers of another century the pleasure I feel in viewing the more perishable poplars of the present time. The causeways near the castle must have been arduous works. The mulberries are in a state of neglect; Mons. Galway's father not being fond of that culture, destroyed many, but some hundreds remain, and I was told that the poor people had made as far as 25lbs. of silk, but none attempted at present. The meadows had been drained and improved near the chateau to the amount of 50 or 60 arpents; they are now rusty, but valuable in such a country. Near them is a wood of Bourdeaux pines, sown 35 years ago, and are now worth five or six liv. each. I walked into the boggy bit that produced the great cabbages he mentioned, it joins a large and most improvable bottom. Piron informed me that that the marquis pared and burnt about 100 arpents in all, and he folded 250 sheep. On our return to the chateau, Mons. de Galway finding what an enthusiast I was in agriculture, searched among his papers to find a manuscript of the marquis de Tourbilly's, written with his own hand, which he had the goodness to make me a present of, and which I shall keep amongst my curiosities in agriculture. * * * * *

## MINERAL MANURES.

Extract from No. 46 of the *Farmer's Series* of the *Library of Useful Knowledge* first published in London, Nov. 15, 1833.

The manures we term *alkaline* and *calcareous* consist chiefly of those substances which combine with acids, though generally with the loss of their distinctive characters, and out of which lime may be extracted by the process of burning. The extent of their utility is only ascertained by practice, which does not speak a uniform language in every place, for scarcely a farmer is to be found who is acquainted with the exact effects of their properties upon soils; from which it may be readily imagined that many will form erroneous opinions, arising out of the local circumstances of their own farms. Their chief advantage, in a natural state, seems, however, to be rather mechanical and alterative, than nutritive. They form a useful component part of the earth; and, in certain proportions, they are found to be essential to the fertility of most soils, or 'perhaps necessary even to their proper texture, as an ingredient in the organs of plants.*' The primitive constituents of which they are formed are composed of chalk, of limestone, or of the shells of fish—and on being submitted to the action of fire, lime is produced.

### *Chalk*

Is a pure calcareous earth, though in almost all cases mixed with particles of clay and sand, which deteriorate its quality, in whatever proportion they exist; it is, therefore, highly important that the farmer should ascertain those proportions, for, when combined with clay, such chalk is most fit for light loams and sandy soils, which it tends to unite, while stiff lands will, on the contrary, be proportionably most benefited by the opposite mixture, and should be applied in the different proportions which the respective qualities of each seem to require. It is, however, frequently laid without discrimination upon every kind of land, though the proper number of bushels necessary for each particular soil can only be accurately determined by a descriminating knowledge both of the different properties of the chalk, and of the ground to which it is intended to be applied. From ignorance of this, farmers are generally without any rule to guide them in its application; but supposing them, from long experience, to have discovered the exact quantity of some particular chalk proper for their own soil, this knowledge can only be local, and cannot enable them to decide upon its effect in other situations.†

When unmixed, its properties in all respects resemble those of pure lime, and the chief motive for burning either that, or limestone, is, that it may be thereby the more easily reduced to that state of powder, and spread upon the ground, by which it can be rendered a more effectual dressing for land. The operation also considerably reduces its weight by the evaporation of the water contained in it, so that, in case of very distant carriage, the cost of fuel may be saved by the difference in the expense of conveyance. The cost of delivery from any great distance is indeed so considerable, as almost to preclude its use, except in the immediate vicinity; and even there, it is usually carted upon the land during hard frosts, when the teams are not otherwise occupied. When laid upon the land in the simple state of chalk, it is also apt to become hard by the drying effects of the wind and air, and as it is dug up in large lumps which cannot be reduced without considerable labor, it thus remains for a considerable length of time, without producing its intended effect upon the soil. When thus used, therefore, it should be taken from the pit in either the latter part of the autumn or the the beginning of winter, while its pores are full of water; for if frost then comes on, it becomes expanded in the act of freezing, and thus bursting suddenly, it crumbles partly into a kind of slime. This, however, leaves the operation to chance; it is, therefore, better to break the chalk into as fine pieces as possible: for otherwise, being exposed to the winds of the spring months, it becomes so dried and hard, that the harrows will take no effect upon it, and to roll it, will only serve to compress it into the earth without breaking it. By this irregularity, too, in its division, a great deal of the seed would also remain uncovered, and its period of ripening being thus more forward where the manure was laid than where the land was left bare, a porton of the crop would be ready to be reaped while the remainder might be still green.

From this difficulty, the use of chalk has been much discontinued, though the fault is not so much in the chalk itself as in the manner of treating it. Regard must necessarily be had to the quality of the chalk, to the tenacity of the soil, and also to its state of poverty or improvement. The quantity laid upon the land is variable, and more governed by convenience than by any scientific notion of its properties: from 400 to 600 or 1000 bushels, and even more, is by no means unusual. It is very commonly laid upon coarse sour pasture at the rate of 150 to 250 bushels per acre, upon which it almost uniformly effects an evident improvement, bringing it from a rush-like appearance, to a fine, sweet, and delicate herbage, intermixed with white clover and the richer grasses, which otherwise remain dormant in the ground. The same good effect is also found when applied to hot gravelly loams, where its cooling properties counteract their tendency to burn in the summer months; and on land subject to sorrel it is a sovereign cure, killing that weed speedily—a circumstance favorable to stock, for it is very unwholesome to sheep, and many lambs are frequently killed by eating it.‡ It also imparts a mellowness

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* Sir Humphrey Davy. Agr. Chem., p. 19.

† 'Pure chalk, being saturated with carbonic acid gas, tends to alter the original disposition of the parts of the soil, where it meets with various substances, either vegetable, animal, or mineral; these substances becoming oxygenated by their action with the chalk, generate their several acids, and these acids disengage the carbonic acid gas, which is readily absorbed by the roots of the plants; it therefore tends, by slow degrees, to separate the cohesiveness of the strong soil, and to admit the roots of the plants to feed upon the carbon with greater facility.'—Malcolm's Comp. of Husb. and Anal. of Manures, vol. ii. p. 32.

‡ Malcolm's Survey of Surrey, Kent, and Sussex, vol. ii. p. 30—39; Young's ditto of Hertfordshire p. 161.

and friability to clays and other strong soils, which prove advantageous to the growth of most kinds of corn, and it likewise assists the adhesiveness of sands, but it can never be usefully applied to land of the same nature as that from which it is drawn: its efficacy is therefore proportioned to the deficiency of calcareous matter in the natural soil.

It is not however possible to get hard chalk thus to break entirely into small pieces, and much of it will remain, perhaps for years, without being reduced by the weather: if, therefore it be intended to produce the same immediate effect as lime, it should be applied in perhaps three, or even four times the same quantity; but its decomposition being more slow, it will also be more lasting. When found of a soft and unctuous quality, it has been laid with remarkable effect on gravel mixed with a small portion of clay, in sufficient quantity to afford a covering of an inch, or an inch and a half, in thickness. Previously to its application, this land was so extremely precarious in its produce, that, although manured, folded abundantly, and trodden by sheep to condense the soil, the expense and care bestowed upon it were rarely compensated by a corresponding return. The wheat grew freely at first, and continued to bear a very favorable appearance until the spring, when the ground assumed a spongy, hollow texture, the plants acquired a dark brownish hue, died in considerable quantities, and only produced from 12 to 16 bushels per acre of light corn, with the straw invariably stunted and blighted; but the same land now yields from 24 to 30 bushels, of excellent quality. The barley, oats, tares, and clover suffered in the same proportion, and have equally derived benefit from the chalking; nor has there been any recurrence of the former unhealthy condition of the soil.*

When employed for the purpose of chalking the surrounding land, it is usually dug out of pits, which are sunk to a considerable depth, by contractors, who travel over the different parts of the country where it is generally found. The common practice on such farms is to fix upon a spot nearly centrical to about 6 acres of land, where a pit, about 4 feet in diameter, is sunk to the chalk, if found within 20 feet from the surface; if not, the contractors fill it up, and sink in fresh places, till their labor is attended with better success. The pit, when sunk, is kept from falling by a sort of basket-work, made of brush-wood, cut green to make it the closer; it is then chambered at the bottom—that is, the pitman digs or cuts out the chalk horizontally in three separate directions of sufficient height and width to admit of their being worked with safety. The laborers are generally three in number—one of whom digs the pit and fills the basket, which is raised by a pulley of very rude construction, which is then wound to the top by his companions, who alternately wheel its contents upon the land. In some places 18 barrowfuls, and in others 16 buckets, which each hold $1\frac{1}{2}$ bushels, are deemed a load, 100 of which are considered as the full extent of chalking an acre, though 40 to 60 is a more usual quantity. The expense varies acccording to the depth of the chalk, as it is found to be better the deeper it lies; and when only 3 or 4 feet from the surface, it is generally so indifferent as to be again thrown into the pit when filled up. In the chalk districts, it is very commonly applied at periods varying from a dozen to twenty years, and with equally various accounts of its success, though its first application is always admitted to be the most effectual. When well mixed with the land, it is generally acknowledged to make it work much better, and with less strength of cattle on heavy ground; and if assisted with dung, or with occasional spring-dressings, to quicken vegetation, it is very universally allowed to improve the crops: its value is often estimated between outgoing and incoming tenants, when lately laid on, as high as £6 per acre.*

*Limestone.*

The *properties of limestone* are similar, though it is very generally believed that lime made of very hard limestone is more efficacious as manure than that which is made from matertals of a softer nature, and hence it is commonly asserted that lime made from chalk is much weaker.† In some places, however, chalk-lime is preferred. Thus we are told by Mr. Boys that, although there is excellent limestone in the centre of the Weald of Kent, yet lime made of chalk is brought from the distance of twenty miles. This might be attributed to a knowledge of the superiority of its practical effect as ascertained by is greater purity and consequent strength; but it would rather appear that the preference arises from caprice, for he also says that chalk is even carried for a considerable distance to the parish of Bethersden, which is famous for a fine limestone.‡ The fact, however, is, that whichever contains the greatest quantity of calcareous matter will be found to be the strongest. If employed without being burned, its effects upon the land are very slow: it acts upon the soil during many years as a mild calcareous earth, but its duration and effects are proportioned to its purity, as the less alloy which it contains, the stronger will it be, and the operation of changing it into lime is of no farther use than as a mode of rendering it more promptly effective. It is also the least expensive, wherever fuel can be obtained at a moderate price; for its weight is thereby reduced to nearly one-half, and it cannot be brought into use as manure without being reduced to powder, the labor of which is very great, while the weight, and consequent charge of carriage, of course remain undiminished.§

Limestone, however, is found in great abundance in many places in which there is a great

*See Mr. Gawler's account of his farm in North Hampshire: Library of Useful Knowledge, Farmer's Series, No. 7.

* Herts. Report, p. 156; Bucks. do., p. 269; Beds. do., p. 495; Berks. do., p. 361; Essex do., p. 205; Kent do., p. 158.

† Anderson's Essays, 4th edit., vol i. Essay vi. part ii.

‡ Boys's Survey of Kent, 2nd edit. p. 89.

§ Dr. Anderson says *two-thirds*, ib. p. 497; but this is upon pure limestone, and immediately after it has been calcined, consequently before it can have acquired any moisture from the atmosphere; the more common calculation is therefore about *one-half*, or perhaps *two-fifths*.

scarcity of fuel; and a scheme was accordingly suggested to the trustees of the forfeited estates in Scotland, by the late Lord Kaimes, for the erection of a crushing-mill, by means of which great masses of rock, when broken into pieces, were reduced to powder. It was erected in the Highlands, at a period when there existed but little spirit for improvement; and we learn from Dr. Anderson, that, 'as there was no public demand for the manure, after the experiment was suffi ciently tried to show that it might be practised with advantage in other places, the mill was suffered to lie unemployed;'* but it is said, in the Survey of the county of Perth, that the machine was swept away by a flood before the benefits of the process could be sufficiently understood. It might, however, be well worth the while of extensive proprietors of land which is locally deprived of the assistance of lime, by the want of coals, or peat, to erect similar machines, as few doubts can be entertained of their utility; for though unburnt limestone, when reduced to powder, has not the same activity as that which has undergone the action of fire, it is yet a valuable article; and, as a gradual improver of the soil, it may even be rendered more useful than quicklime.

*Limestone gravel* is also an article among our manures which is deserving of consideration. It consists of masses of stones, pebbles, and sometimes of slate and ragstone, resembling a concretion of small stones, or gravel, which, when spread upon the ground and mixed with it, gradually disunites and fertilizes the soil, according as the gravel crumbles down and mixes intimately with it. It is chiefly used on stiff clayey soils, and has been eminently useful in the improvement of boggy and wet bottoms, from which the water had been previously drained. In many such instances it has been found a better and more lasting manure than marl, mellowing and correcting the tenacity of the clay, and producing the white and purple trefoil where sour grass grew before. It is common throughout many parts of Ireland, and in some of the English counties, but it is not generally known in Scotland†.

### *Fish-Shells.*

The *shells of fish*, when burnt, produce the purest species of lime; but they are more commonly employed in a pounded state, in which they may be so advantageonsly used, that oyster-shells, when crushed and drilled upon 27-inch ridges, at the rate of 40 bushels per acre, produced as fine a crop of turnips, as another field of the same land, manured, for the sake of the experiment, at Mr. Coke's, at Holkham, with farm-dung at the rate of 8 tons per acre; nor was there any apparent difference in the succeeding crops of barley and clover. The powder has also been tried at the same farm, for wheat, in competition with rape-dust—both powder and dust at the rate of 4 cwt. per acre, each drilled on a light gravelly loam, in both spring and autumn. The crop was not, in either case, measured, but there was no perceptible difference in either. The field was afterwards sown with turnips, and the produce proved a good crop*. Yet, notwithstanding the result of these experiments, no fair conclusion can be drawn from them regarding their respective effects, as manure, in that sense in which it is understood to mean nutriment; for, although lime may excite the powers of other nutritive matter in the soil, and thus promote vegetation, it possesses no substance, within itself, which can impart nourishment.

In some places these shells are found in large beds almost entire, and they may be then either ground by passing them through the oil-cake crusher, or broken into pieces by repeatedly drawing a heavy stone, or iron roller, over them, when spread upon a floor of flags or clinkers. There is, however, a more economical mode of attaining the same object, which is by merely making them the lower tier of a dunghill, or by spreading them at the bottom of the farm-yard in which the drainage of the urine will decompose them, and in that state the manure will possess all the advantage of a compost with lime†. They may also be used whole on stiff land or clay, on which they act mechanically, opening and loosening the clods, and by that means making way for the roots to penetrate their fibres. To such land they will be found very serviceable, and as they moulder gradually, every year a little, until they are quite spent, they wear down slowly, and their effects, when laid on in sufficient quantity, are long perceptible; but they should not be applied to sandy ground.

On many parts of our coasts, *shell-sand* also forms a valuable species of manure, for the shells which are deposited at the bottom of the sea become there in time decomposed, and the sand which is within reach of the tide, being thrown upon the shore in storms, is, in some places, carted off, and laid upon the land with considerable advantage, though in other parts, the practice seems utterly unknown. Being finely attenuated, it blends intimately with the soil, and thus produces very sensible effects in the correction of cold clays and cohesive loams, on which it is usually laid to the amount of about twenty tons per acre. Its chief value will, however, be proportioned to the quantity of calcareous matter, or of shells, which it contains, and this is in some places found to be so large as nearly to equal the common properties of lime.‡

It is also found in strata, imbedded in sand-cliffs, at the height sometimes of 40 or 50 feet above the level of the sea, in which places it is generally denominated *crag*, and was, no doubt, deposited in former ages, ere the water had receded from the shore.

### *Lime*

Is applied to a great variety of uses: it is employed in medicine as an anti-acid; mortar is com-

* See discription of the mill in his Essays on Agriculture, vol. i. p. 496, 4th edit: also an engraved plan for a similar machine in the Farmer's Magazine, vol. iii. p. 146.

† General Report of Scotland, vol. ii. p. 537; Survey of the County of Dublin, App. p. 17, from Dr. Rutty's Nat. Hist. of the County.

* Extract of a letter from Mr. Blaikie, Steward to Mr. Coke of Holkham, to Sir John Sinclair, dated Sept. 18, 1818.

† Communications to the Board of Agriculture, vol. vi. art. iii.

‡ Survey of Cork, Add., p. 45.

posed of it, when combined with sand; and it serves as a manure, which is the only view on which we now have to regard it. When used for the purpose of agriculture, it is formed by exposing the substances we have mentioned to a certain degree of heat in the furnace, or kiln, of the lime-burner. When this has been continued for a sufficient length of time, their weight becomes considerably diminished, though they retain their former shape and bulk; and either limestone or chalk, when thus reduced, is in most places known by the name either of *lime-shells*, or *shell-lime* or simply, *shells*. In this state it is called *quick-lime:* the materials of which it is thus composed possess hardly any active property, but when burned, it then becomes caustic to the tongue, and effects the speedy decomposition of most vegetable and animal bodies. When applied in this form—either in the way of compost, or spread over the soil by itself—it is so far from affording nutriment to anything that may be there growing, that, were its effects to be long continued, it would consume it. But if water be thrown upon it, a great degree of heat is in a short time generated; the burnt shells begin to crack and burst asunder; and the mass gradually crumbles down, or falls, as it is more commonly said, into a fine powder, which becomes white, of whatever color it may have been before it was calcined. Or when it has been exposed for a short time to the influence of the atmosphere, it is also found to lose this caustic power, and it is thus reconverted into a substance of the same mild nature as that from which it was obtained—in all its properties exactly resembling chalk*.

This operation is called *slacking*, or *slaking;* and lime, when deprived of its scorching quality, is termed *slaked-lime*, or, in the language of chemists, *effete*. Instead of watering it in heaps, the practice which generally prevails is to lay the shells upon a fallow, in small hillocks of about a bushel and a half each, either thrown up around the circumference of each heap, or covered up immediately with some fresh soil made very fine, which, when laid on moderately thick, should be clapped close down with the back of the spade, so as to exclude the admission of either air or rain. In this state it may remain for a few days, care being taken during that time to keep every part of the heaps tight and sound, when it will be found that the moisture of the earth will have completely slaked it. Although it may be thought that this covering of the lime is unnecessary, it yet has this use—that without it the rain would form crusts over the heaps, which would not only prevent the moisture from penetrating regularly through them, but would also hinder them from being pulverized without considerable difficulty. It will then be fit for use: and when spread over the field, it should be immediately ploughed in with a shallow furrow, and well stirred with the harrows in every direction. Upon an 18-feet ridge these heaps will be the same distance, or 6 yards, asunder, from centre to centre, if about 200 bushels be laid on per acre; and so on when other quantities are applied. Instead of slaking the lime in this manner, it has however been recommended to lay it down in a long heap, or mound, on one side of the field on which it is to be applied. Two laborers are then employed to turn the mound, and a third waters it. When the whole has been thus gone over, it is allowed to lie for four or five days, after which it is again turned, and if any part of the lime should be found to be still unslaked, more water is added*.

From this it will be perceived, that one chief cause which renders the burning of lime necessary, arises from the extreme difficulty of obtaining the powder without the process of grinding; but by being thus more finely divided, it can also be more evenly diffused over the soil, with which, therefore, it becomes more evenly mixed, and more prompt in its effects upon the land; and when laid upon it in its hot state, it not only occasions the destruction of weeds, but powerfully stimulates the action of manure. An idea, indeed, generally prevails, in consequence of burning being the mode usually resorted to in the employment of lime, that calcination is necessary to render it fit for use as manure; but this, as we have already remarked, is a mere mistake.

One very strong reason for applying it instantly is, that, if spread immediately after being turned, and while yet in a powdery and caustic state, a smaller quantity may suffice to cover the whole surface of the ground, and to come into contact with more minute particles of the soil; whereas, if suffered to lie for any length of time exposed to the atmosphere, it imbibes so much moisture, that it runs into clods, and can never again be so equally divided into small parts; wherefore a much larger quantity is required to produce the same immediate effect. It is in this state, also, that it acts the most powerfully upon all organic matter which may be already lying undecomposed within the soil—insects, the fibres and roots of obnoxious plants, and the seeds of weeds—which it dissolves and transforms into mould. It is also more efficacious than effete lime in its influence upon what is called *sour land;* though simple chalk, if applied in large quantities, will correct the evil. Neither is it improbable that, during its process of slaking, the heat which it generates by the absorption of moisture causes it to swell in a manner which the tenacity of the soil cannot resist: thus producing fermentation, it not only eventually makes the land mellow, but renders matter which was comparatively inert, nutritive, and is probably more beneficial to land containing much woody fibre, or animal fibrous matter, than any calcareous substance in its natural state†. If, therefore, quicklime really possesses superior qualities as a ma-

* See Hornby on Lime, p. 10; Dr. Anderson's Essays relating to Agriculture, vol. i. Essay vi.; and Sir Humphry Davy, Lect. vii. When moistened with sea-water, lime yields more alkali (soda) than when treated with common water; and is said to have been used in some cases with more benefit as manure—Ibid., p. 298.

* Library of Useful Knowledge: Farmer's Series, No. 18,—Report of a Farm in Ross-shire. Malcolm's Survey of Surrey, Kent, and Sussex, vol. ii. p. 46; Papers of the Bath Society, vol. ii. art. xxviii.

† In its *first effect*, burnt lime decomposes animal matter and seems to accelerate its progress to a capacity of affording nutriment to vegetables: gradually, however, the lime is neutralized by carbonic acid, and converted into a substance analogous to chalk; but in this case it more perfectly mixes with the other ingredients of the soil, and is more pervadingly diffused, more finely divided, than mere chalk artificially applied. Sir Humphry Davy, Elem. of Agric., Chem., lect. vii.

nure, it seems only fair to infer, that the greater the strength and vigor of such properties, the more assuredly will they effect its purpose when in that state, than after it has been rendered effete.

Considerable judgment is however requisite in this mode of its application; for, although it promotes putrefaction, and converts the pulp, or saponaceous substance, of vegetable matter into the food of plants, yet, if too great a portion of lime be added, it may have a contrary effect, and it always destroys, to a certain extent, the efficacy of animal manures, either by combining with certain of their elements, or by giving to them some new arrangement. It is necessary to the reduction of carrion, or for qualifying the noxious effluvia of night-soil; but is so injurious when mixed with any common dung, that it tends to render the extractive matter insoluble*: thus if a sufficient quantity of quick-lime be added to a heap of stable-dung in a state of fermentation, it will set it on fire, and the whole will be consumed. It should never, therefore, be mixed with farm-yard manure, unless a small quantity be found absolutely necessary for the prompt destruction of seed-weeds, or the decomposition of roots; but when laid upon the land during the same season, the dung should be ploughed down alone, and the lime afterwards harrowed in with the seed-furrow. It may, indeed, be observed, that the dung dropped from horses in their work about kilns is usually so completely destroyed by the lime which falls from the carts in filling, that it is generally found useless to apply it to the land. It also consumes the growing herbage; but, if prudently used, it does not appear to reach the roots, as a fresh verdure soon after arises, and seeds which had previously lain dormant in the soil are brought into action‡.

By neutralizing the acids combined with the mould, this manure qualifies the vegetable and other soluble substances also present in it, and occasions the whole to be converted, by the influence of the atmosphere and of water, into nutriment for plants; but in poor soils, having less vegetable matter to convert into mucilage, it acts so powerfully as not only to exhaust such land by its final effects, but to be prejudicial to the immediate crops§. We have, indeed, the opinion of a very experienced farmer, who is also well versed in chemistry, 'that, should much rain immediately succeed the ploughing, and any considerable portion of sand be either in the lime, or in the soil, it is almost a moral certainty that such soil will be in a worse state than it was before the lime was put on; because, the moisture being retained by the lime and the soil, and the tenacity of the substratum not suffering the superabundance to pass quickly away, it causes the whole to run together, and form a compact and impervious bottom, which before, however, might have been pervious in a slow degree. That this must be the case is evident from this consideration—that quicklime, mixed with a certain portion of sand, and duly moistened, contracts and forms a substance which we call mortar, or cement; in proportion, therefore, as the quality of these materials is more or less perfect, so does the substance become more or less compact, hard, solid, and impervious: such must be the condition of the soil; and it is but reasonable to suppose that a great part of the seed sown upon it must perish*.'

It may indeed be alleged that the caustic action of quick-lime can never be exerted to any great extent, as it attracts fixed air too strongly not to become immediately slaked; but its effects are found to be powerful even in that short period, provided that it be promptly and intimately mixed with the soil, for though the land should contain an abundance of vegetable matter, yet if it has been injudiciously cropped, or insufficiently manured, the lime will only add to its infertility.

As the dust of quick-lime is prejudicial to health, care should be taken by those who spread it over the land to work upon the windward side. Precaution should also be used, when it is ploughed in immediately after being spread, to do so when the soil is quite dry, as well also as to prevent the horses from passing through any wet places when going to field; for though the powder of dry lime, when in a caustic state, does not take any apparent effect on the skin, and the hands of a person who has wrought in it are not in the least injured, yet it very soon corrodes the hair and flesh, if it has access to water, and horses have been thus irrecoverably lamed. When unharnessed, they should, therefore, be kept dry until thoroughly brushed over, so to completely remove the dust which may adhere to their coats, and more particularly to their feet and legs. They may thus work without any danger; but, in case of accident happening to either men or horses through being scalded by the lime, the part affected should be immediately washed, either with vinegar or with very sour milk, by which its irritation will be prevented. After the lime has been slaked, it will become effete in about a week, and will then be as little corrosive as any common kind of earth; so that the horses may work among it with entire safety: but if it has been suffered to run into clods before it was spread, these, if not broken into small pieces, will be longer in absorbing a sufficient portion of air, and therefore will remain longer in an

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*Sir Humphrey Davy, Elem. of Agric. Chem., 4to., p. 280.

‡ A circumstance has been related of mild and quick lime having been separately laid upon land, with the following effect:—the spot upon which the former was laid was soon covered with white clover, but on that on which the latter was left, no vegetation whatever took place for a considerable time, when it at length produced couch-grass, which is accounted for by the hot lime having retained its causticity so long as to have entirely destroyed the seeds of the clover, which are generally diffused in calcareous soils, and consequently flourish through the application of mild lime; while those of the couch were either more difficult to eradicate, or were spread from the adjoining land.—Sinclair's Code of Agric., 3rd edit., note p. 235.

§ 'All the experiments yet made render it probable that the food of plants, as it is taken up from the soil, is imbibed by the extremities of the roots only.—Hence, as the extremities of the roots contain no visible opening, we may conclude that the food which they imbibe must be in a state of solution at first; and in fact, the carbonaceous matter in all active manure, is in such a state of combination as to be soluble in water whenever a beneficial effect is obtained.—Dr. Thomas Thompson's Chemistry, 3rd edit., vol. v. p. 376.

* Malcolm's Survey of Surrey and the Neighboring Counties, vol. ii. p. 41—43.

acrid state, so that the ploughing will be better deferred for another week, or even longer*.

When quick-lime has been deprived of its causticity, it is called by chemists *carbonate of lime*, and in that mild state it does not act upon animal or vegetable matter with the same violence as quick-lime, but instead of dissipating any portion of the substance which may be contained in the soil, it facilitates its reduction into that state by which it the most effectually assists vegetation. Neither has it the same tendency to combine, as it were into a mortar, with the sand of poor clays.

*Lime*, however, *whether quick or slaked*, when used by itself, without any addition of earth, is not possessed of any vegetative quality: thus, 'seeds planted in a flower-pot filled with powdered carbonate of lime, regularly watered, vegetated feebly, made little progress, and died without coming to perfection; but when partly filled with garden-mould, and carbonate of lime 1½ inches thick over it, the plants put down their radicles straight through the lime, without ramifying or stretching sideways, till they arrived at the mould. Even in a mixture where lime was only one-fifth, the plants were poor and sickly, and made no progress; and when quick, it, with the aid of water, suddenly destroys all vegetable substance.'† It may even be hurtful to vegetation when laid in too large a quantity upon very light and warm soils; for, by quickening evaporation, it dries the land too much, by which means, plants are deprived of the moisture necessary to their sustenance; therefore it is, that calcareous earths are frequently known by farmers as 'burning soils;' and, by its injudicious use or repetition, without the aid of animal or vegetable manure to supply the nourishment of which they have been deprived by crops, the growth of which has been thus forced, land, though of superior quality, may at length become exhausted.‡ Thus experience teaches that lime, when applied to land, has different effects upon some soils than it has upon others: on many there is a rapid and permanent improvement, on others there is less benefit, and on some it is said rather to retard than to promote vegetation. This is no doubt chiefly influenced by various unascertained properties in the soil, and partly also by difference in the qualities of the lime itself, arising from its mixture with other earths.

Whether it possesses any further properties, through the stimulating effects of light and heat upon the vegetable fibre, has been conjectured, but has not been supported by any positive fact, and seems to be contradicted by the slow effect of effete lime in its operation upon the soil. It is, however, worthy of remark, that calcareous earth is found in the ashes of all vegetables; that it is present in a larger proportion in wheat, clover, and some other plants whose growth is especially promoted by the use of calcareous manures, and many are said not to ripen in ground in which it is entirely wanting.* We may therefore conclude that it is of the highest importance in the process of vegetation, and that an accurate investigation of its mode of action, by enabling us to judge with more certainty of its powers, would greatly tend to the improvement of agriculture. It is indeed much to be regretted that the subject has not been more fully investigated, and that some more definite judgment has not been framed regarding the properties of lime, the effects of which in its application to the soil are exposed to the most contradictory results. Much money has thus been uselessly expended, and labor thrown away, which, under better information, might have been saved; and without scientific analyses of the component parts both of soils and of lime, we remain much in the dark regarding their effects on vegetation; but, judging from the faint lights with which we have been furnished, we shall still endeavor, by comparing science with practice, to obtain such instruction as may guide us to an economical and useful application of this manure to field culture.

### *Application of Lime.*

Those purposes appear to be—first, to render whatever substances may be lodged in the soil, or matter which forms part of it, and which may be injurious to vegetation, either harmless or useful; and thus to prepare the soil for the reception and nourishment of seeds and plants: and secondly, to facilitate the decomposition of putrescible matter, so as to furnish food to vegetables during their growth. It has been proved by careful experiment, that the application of lime is the only known alterative which, upon poor, weak, and weeping clays, has power to heal the soil. With the assistance of water, it suddenly decomposes all animal and vegetable bodies, and when thus spread upon neglected ground covered with heath and moss, the old turf is decomposed, and a saponaceous matter is formed, which sinks into the soil and covers it with sweet herbage. We also know that it imparts a certain degree of vigor to some peculiar plants,—as, for instance, sainfoin, the roots of which penetrate far into the interstices of chalk, and grow luxuriantly, though only covered by a slight coat of inferior soil.†

It is however an error, though entertained by many farmers,—to suppose that lime in any state comprizes fertilizing properties within itself; and that, without operating upon the soil, or upon the substances which it contains, it is an enriching manure. It does not possess any fertilizing principle in its own composition; it is merely a calcareous earth combined with fixed air, and holding a medium between sand and clay, which, in some measure, remedies the deficiencies of both. But though, when alone, unfavorable to the growth of plants, yet experience shows that it is an ingredi-

*Andersons's Essays, vol. i. Essay vi. part ii.; Malcolm's Survey of Surrey, Kent, &c., vol. ii. p. 58; Theaër, Principes Raisonnés d'Agriculture, vol. ii. p. 392.

†Naismith's Essay on Manures in vol. ii. of the Appendix to the General Report of Scotland, chap. xii. p. 89.

‡Gyllenborg's Chemical Treatise on Agriculture; Pilkington's Trans., chap. x sect. viii.

* Malcolm's Comp. of Agric., vol. p. 57; Anderson Essays, vol. i.

† See Naismith's Elements of Agriculture p. 334. Thaër, Principes Raisonnés d'Agriculture, 2nde edit., tome ii. p. 387; and Anderson's Essays, No. vi., part 2, Aphorism iv., in which it is stated, that calcareous matters act as powerfully upon land that is naturally poor, as upon land that is more richly impregnated with those substances which tend to produce a luxuriant vegetation.

ent in soils which, whether naturally forming a component part of their substance, or judiciously mixed with them by the husbandman, adds greatly to their fertility, for it has the power of attracting much both from the earth and from the air, which occasions the decomposition of plants, and thus converting them into nutriment, it gives power as to vegetation which, without its operation, would otherwise lie dormant. It also appears to act with great force upon that substance which, being already converted by the decomposition of plants into a species of earth, we call *mould.*

The other causes with which we are acquainted regarding the operation of lime as a manure, would lead to a chemical discussion, which could only prove uninteresting to the generality of our readers; we shall therefore confine ourselves to the following observations. There can be no doubt that it is a most powerful stimulant when applied to deep loams and heavy clays, which contain mould of a nature so sour as to appear to unfit them for the purposes of vegetation; or to land which has been previously either more or less manured with animal or vegetable substances, without any addition of lime or other calcareous matter, in which case it often produces effects far more fertilizing than the application of dung, for its active powers render every particle of the putrescent manure useful; but if the latter be not afterwards repeated at no great distance of time, the soil will, in the couse of a few years, become considerably exhausted. In all arable land, however impoverished it may be, either by nature or bad management, there yet always exists some portion of mould, and, on this, a first dressing of lime occasions a sensible improvement of the soil, which soon becomes apparent in the increased product of the crops. A second dressing will also be attended with some apparently good effect; but unless that, and every succeeding repetition, be accompanied with ample additions of farm-yard manure, or other putrescent matter, to supply the loss thus occasioned by the exhaustion of the vegetative power, every future crop will be diminished. The land is then necessarily thrown out of cultivation, and left for a series of years to recover itself under pasture, which, in the course of time, may be effected according to its former condition; but in the interim it is rendered nearly fruitless. It is thus that many thousands of acres in every part of the kingdom have been run to a state of almost total infertility; and it is even said, that the too great use of lime, though apparently judiciously employed, by some of the first farmers in the Lothians, has been lately found very detrimental to their crops.

*Marsh lands,* however, which have been drained, will generally support a repeated and abundant application of lime, because they usually contain a large proportion of matter upon which the stimulating powers of lime are peculiarly adapted to act; and it will be found much better suited to the purpose than dung. On all rich, deep, dry, and loamy soils it may also be applied with effect; for although they contain within themselves the competent parts of the best soils, yet they are frequently found to be sluggish and inert; and dung, whether through imperfect fermentation or owing to the want of calcareous matter, often remains dormant in the land until roused by moderate quantities of quick-lime, which, if applied at distant periods, will effectually operate to bring it into activity. It should, however, be turned into the ground some weeks before the dung, in order that it may become thoroughly slaked by mixture with the soil, or otherwise it would have the effect of abstracting some of its nutriment. Such soils, after the application of lime, produce much heavier crops with a much smaller proportion of dung than if no lime had been used, because the operation of the latter acting upon the dung renders every portion of it useful.

*Clay land* shows an evident disposition to combine with lime, and it bears the repetition of this species of amelioration better than lighter soils. When applied to heavy tillage land, either for the purpose of reducing its cohesive properties, or of supplying an additional quantity of calcareous matter, small dressings of lime will have but little effect; and if sand or calcareous earths are to be employed, it is recommended, by a practical farmer of known experience, as more economical to apply them separately than as a compost.* It powerfully assists all adhesive soils; and when laid hot from the kiln upon deep clay, it has been known to occasion a very large increase in the former crops. It has also been often observed, in fallowing clayey soils, 'that, in wet weather, when a dose of lime has been just given, the land continues more friable, and is less apt to bind up on the recurrence of drought than where it has been neglected. The grain growing on the well-limed ground preserves its healthy appearance in wet seasons, while that growing on land that has not been limed is yellow and sickly.'†

Upon *sandy soils*, which seldom abound much in vegetable matter, lime has a mechanical operation, which, by combining with the finer particles of the soil, gives consistence to the staple of the land, and attracting the moisture from the atmosphere, it imparts it so gradually as to be less liable to be hurt by drought in those parching seasons by which crops are injured. It is therefore said to be cooling to hot land; but if it be not also mixed with some portion of clay, with which it may combine, it then is apt to unite itself with the sand, with which it composes a kind of mortar, the effect of which has been already described, and which cannot be dissolved without much difficulty, and the plough often brings hard lumps to the surface of the soil which cannot be easily broken. Thus when such land has been frequently limed, nothing can restore it but the abundant and reiterated application of putrescent manure; the demonstration of which is perceptible throughout many parts of England, where from possessing a chalky soil without strength to maintain a sufficiency of live stock to furnish dung, the land has in many places been worn out through the inconsiderate use of lime.

On the *exhaustion of land by the application of lime* there is, however, much difference of opinion. It is indeed evident that the continuation of cropping, without an addition of nutritive manure, will ultimately exhaust the best soils; but though their natural fertility be thus aided, it yet cannot depend entirely on that support. This must be apparent if we reflect that land, without any addition of animal or vegetable substance, will still produce crops:

* Russell's Pract. and Chem. Agr,

† Library of Useful Knowledge Farmer's Series, No. 12, Report of a Farm at Kyle, in Ayrshire.

for pure sand, clay, and chalk, though each in themselves separately barren, yet, when mixed together, exert chemical influences upon each other, which, by the attraction of the air, the dews, and the rain, the force of the sun, and the generative powers of growing vegetables, effect the production of corn and fruit. It is therefore clear that the land alone is capable of vegetation; but every day's experience proves that the amount of its products, its fertility, in short, depends in a great degree upon the decomposition of the substances which have been previously converted into vegetable mould, or which are added to it by manure. Any thing whatever may be called manure, which, when applied to the soil, either rectifies its mechanical defects, corrects any bad quality, and either stimulates it to yield, or stores it with nutriment. Thus, if lime be laid upon pure sand, although the latter would be rendered more tenacious, and would thereby become more favorable to the germination of vegetables, yet seeds could find no nourishment from either the lime or the sand; and putrescent manure would still be necessary to produce a crop. But if the soil consist of clay and sand, containing animal or vegetable matter in a torpid state of decay, then lime would be preferable to dung. The state of the soil should therefore be minutely inquired into before lime is employed; and it should be only used to give effect to the inert substances with which it may be combined.*

By the analysis of soils, we find that all productive earth contains a certain portion of lime; and although we learn from experience that its stimulative powers upon the roots of plants are very great, yet we are but imperfectly acquainted with the extent or the exact manner in which its influence is brought into action, and 'we are in a great measure ignorant of the actual changes that are produced upon the earth after this manure has been applied.'† It would however, seem that, where it exhausts, it is only by hastening the putrefaction of the animal and vegetable matter in the soil, and by that means applying a larger portion of those substances in a given time than could be otherwise afforded to the growth of plants. It is thus known to produce more luxuriant crops, and it will also consequently enable the farmer to continue his land in tillage, during a certain time, with more effect than if no calcareous manure had been laid on; but, although it may not tend to the deterioration of the original staple of the soil, it can hardly be doubted that it must be thus more promptly deprived of its fertility than if the exhaustion of that vegetable mould with which it had been supplied by nutritive manure were occasioned by a more gradual process of decomposition.

That this is the only way in which effete lime can exhaust land, seems probable from the large quantities of neutralized calcareous earth which are often applied without any bad effect in the form of chalk, shells, limestone-gravel, and the whole tribe of marls. A larger quantity of these is oftener laid on in one year than would be used of lime in half a century, were the land in tillage to be managed according to the custom of some countries; yet it is not generally impoverished, and, in many cases, it is permanently improved. This, however, is probably occasioned by its combination with other substances, which either counteract its exhausting powers or supply the waste of nutritive matter. It must, however, be admitted, that this is not apparent in regard to chalk, which is commonly applied in large quantities without any bad effects, and there are many instances of soils more naturally fertile than perhaps any others that are known, and which seem to consist almost wholly of calcareous earth;* but were their properties critically analyzed, it is still possible that they might be found essentially different from those which they are commonly supposed to possess.

A very eminent writer on agriculture, when treating of stimulant manures, which are generally supposed to be only of use when applied to rich soils, and when applied to poor land would produce hardly any, or even hurtful effects, says, in contradiction to that theory—that 'he is firmly convinced, from repeated observations, that lime and other calcareous manures produce a much greater *proportional* improvement upon poor soils than on such as are richer: and that lime alone upon a poor soil will, in many cases, produce a much greater and more lasting degree of fertility than dung alone.'† That, however, does not throw any doubt on the assertion, that it acts with as great *proportionate* power upon land that is naturally poor, as upon that which is more fully impregnated with those substances which tend to promote a luxuriant vegetation; but we believe that the experience of farmers will prove that its application to poor land, and especially to that which has been previously limed, if it does not eventually tend to its complete exhaustion, will at least never be found to repay the expense.

The employment of lime seems to be of the greatest service in the *breaking up of fresh and coarse land*, on which it acts more powerfully than on soil which has been long in cultivation; and indeed the most striking improvements have been effected by its means on moorlands and mountain; but it should be given for the first time abundantly. Such is the usual effect of lime upon arable: upon *grass-land* it is laid in smaller quantities; and in this top-dressing, perhaps the preferable mode is to apply it in a compost with earth; except when the soil consists of clay. When thus spread upon the surface, its action upon the sward is productive of the most palpable improvement, and continues perceptible during a long period. No other manure will create so rapid a change; for it is such an excellent corrector of acidity, that it tends to produce the sweetest herbage where only the most unpalatable pasture was formerly to be found. This, indeed, is so apparent, that if a handful of lime be thrown upon a tuft of rank, sour grass, which has in former years been invariably refused by cattle, they will afterwards eat it close down. Now, animal dung, when dropped upon coarse benty sward, produces little or no improvement, until limed; it then, however, not only

* Finlayson's Practical Essays on Agriculture, 2d edit., p. 111; Bland on the Principles of Agriculture, chap. iv.

† Anderson's Essays on Agriculture, 4th edit. vol. i. p. 526.

* Malcolm on the Agriculture of Surrey, Kent, and Sussex, vol. ii. p. 55. Marshall's Midland Counties, vol. ii. Minute 100.

† Anderson's Essays on Agriculture, vol. i. p. 569.

augments the crops, but the finer grasses continue in possession of the soil, and the land is thus doubly benefited; for the dung dropped by the stock on which it is pastured, is both increased in quantity, and improved in quality.* Farmers should never consider lime as the food or nourishment of plants, but as an alterative of the soil; never to be used but when nature requires it, either to dissolve noxious combinations, and to form new ones; to bind loose soils, or to diminish excessive cohesion; and to reduce the inactive vegetable fibre into a fertile mould. For such purposes there is not, perhaps, a more valuable article in the whole catalogue of agricultural remedies; but some farmers, who do not reflect upon the subject, when they perceive that lime has once excited the dormant powers of the soil into action, and that good crops succeed for a few years, are apt to draw from thence very false conclusions, and continue liming and tilling without the assistance of putrescent manure, until their land at length is rendered incapable of the production of corn. It has indeed been pertinently observed by a good judge of such matters, 'that there is an analogy between the treatment suitable to the animal and vegetable creation. When medicines have removed the cause of their application, they are discontinued, and the patient, rendered weaker by the application, requires some invigorating aliment: in like manner, some time after an effectual liming, the soluble carbon of the rotten dung, or some such restorative, should be applied to the soil to replenish it with what it may have been robbed of by the action of the lime.'†

In fine, lime should always precede putrescent manures when breaking up old leys for cultivation, for, if the land contains acids, or noxious matter that is poisonous to plants, they will be decomposed and rendered fit for vegetation; and hence the superiority of lime to dung on new lands. But calcareous and putrescent manures operate very differently: 'the former, being more stimulant and corrective, help the farmer to an abundant crop at the expense of the soil alone; while the latter furnish the land at once with fertilizing fluids, and will insure a good crop on a place perfectly barren before, and after the application of lime.'‡

Much uncertainty prevails among farmers *regarding the state of lime:* some contending that it should only be applied when hot and powdered, and that when it has been slaked, its effect is comparatively trifling; others maintain the contrary. But these disputants consist chiefly of men whose experience has either been confined to one kind of soil, or who have only used it under particular circumstances, and as they only condemn the system of others because their own has turned out successful, or the reverse, it is not improbable that, in the view they take of the subject, each may be in the right. It will therefore probably be found, that in all cases where the land is constitutionally disposed to receive benefit from a calcareous dressing, that is to say, when it has not been previously limed, or when it has been long laid down and refreshed by grass, or enriched by the application of dung, it is of little importance whether the operation take place when the lime is quick or effete. Upon waste lands, however, its causticity has an evident and necessary effect; for the undecayed vegetables, which abound in all soils in a state of nature, should be speedily decomposed, and it should therefore be spread hot from the kiln. In point of economy, too, there can be no doubt but that it is most thriftily used when laid upon the land in the latter state: for the labor is less; and a smaller quantity will serve the immediate purpose. It is, however, obvious that the choice of circumstances and season is not always in the farmer's power; and that necessity often obliges him to lay it on when completely effete. It has been said, indeed, upon high authority, that caustic lime exhausts the land; but repeated trials have shown that its ultimate effects are equally beneficial in the one state or the other, though there is a more immediate advantage in the employment of quicklime by the destruction of weeds. A common method is to leave it spread during some months upon clover or sainfoin, not intended to be broken up until the following year—a plan which is advisable with regard to marl, which partakes of some of the qualities of lime, and is the better if allowed to remain during a season exposed to the atmosphere; but the stimulating properties of quicklime will be thereby lost, as it will be converted into mere chalk. Opinions are also much divided respecting its effects when laid upon pasture land which is intended to be kept in grass. There is indeed no question that, in either state, if applied in moderate quantities to a dry soil, or to land that has been completely drained, such a top-dressing will have the most beneficial effect upon the herbage; but it must be admitted, that when laid on quick, it requires more circumspection in its application, and should not be employed in the same quantity as when effete.*

We learn, from the General Report of Scotland, that there, 'in the best cultivated counties, lime is now most generally laid on finely pulverized land, while under a fallow, or immediately after being sown with turnips. In the latter case, the lime is uniformly mild: in the former, quicklime, as pernicious (in a certain extent) to vegetation, may be beneficial in destroying weeds; and some experiments have been recorded, showing it to have a very powerful effect upon the fly, to which we shall find future occasion to advert. Sometimes mild lime is applied in the spring to land, and harrowed in with grass-seeds, instead of being covered with the plough; and under this management a minute quantity has produced a striking and permanent improvement in some of the hill-pastures of the south-eastern counties. Its effects are yet perspicuous, after the lapse of nearly half a century. In some places lime is spread on grass-land a year or more before it is brought under the plough, by which the pasture in the first

* In Derbyshire the farmers have found that, by spreading lime in considerable quantities upon the surface of their heathy moors, after a few times the heath disappears, and the whole surface becomes covered with a fine pile of grass, consisting of white clover and the other valuable sorts of pasture-grasses. Anderson's Essays, 4th edit., vol. i. p. 527. Survey of Derby, vol. ii. p. 437; and of Westmoreland, p. 235.

† Walter Davis, Survey of North Wales, p. 303.

‡ Finlayson's Practical Essays on Agriculture, 2nd edit., p. 112.

* Essay on Manures, by Arthur Young, in the Papers of the Bath Agricultural Society, vol. x. p. 119. Farmer's Magazine, vol. iii. p. 77. Thaër, Principes Raisonnés d'Agriculture, 2de edit., tom. ii. pp. 388, 399.

instance, and the cultivated crops subsequently, are found to be greatly benefited. But in whatever manner this powerful stimulant is applied, the soil should never be afterwards exhausted by a succession of grain-bearing crops—a justly-exploded practice, which has reduced some naturally fertile tracts to a state of almost irremediable sterility.'

To point out the precise effects of lime, and the proper quantity to be applied, to the extent to which it has been already ascertained, would greatly exceed the limits of this publication; and were it possible to define its powers upon every gradation of soil, a series of experiments would be required which would occupy the labor of a long life. Its qualities, too, differ materially in various places, from the greater or less quantities of extraneous substances with which it is combined. It is very rarely that any farmer can obtain a choice of lime, and when only one species can be procured he must be content with it; but he may, nevertheless, be benefited by the following observations.

### *Qualities and quantity of lime.*

*Pure limestone*, or *chalk*, when fully calcined, is reduced to a fine impalpable powder, that feels soft within the fingers, without the smallest tendency to grittiness: but such lime as contains sand is neither so soft nor fine, but feels more or less gritty in proportion as the sand is coarser or finer, and more or less in proportion. Commonly, the whitest lime is the best; when perfectly calcined, it is generally of a bright white, without any shade of color, and if clouded, it is thought to proceed from a mixture of other matter; but the color is not an infallible criterion, for dark colored lime has, in some few instances, been found stronger than that which was perfectly white. The purer and the stronger the lime is, the lighter also it will be found when weighed. Hence it follows, that the best lime for the farmer's use is that which is the softest to the touch, the whitest, and the lightest.

The other simple tests for ascertaining its quality, which will be found sufficient to decide upon the comparative value of any two kinds of lime, and may be relied upon as sufficiently accurate for the common purposes of the farmer, are as follows:—if the limestone loses much of its weight in calcination, and the lime-shells are extremely light—if the shells require a very large proportion of water to slake them fully—if it is long before they begin to fall—if the limestone is not apt to *run* (or to become vitrified) in the operation of burning—if it falls entirely when it gets a sufficient quantity of water, after it has been properly calcined—if it swells very much in slaking, and if the lime is light, fine to the touch, and of a pure white—he may be satisfied that it is extremely good, and he may use it in preference to other lime that is inferior to it in any of these respects. The presence of lime may also be discovered by its effervescence, or ebullition, on being exposed to common vinegar.*

When quick-lime, too, is completely sifted through a fine hair-cloth, that is the strongest which leaves upon the cloth specifically the smallest of earthy or sandy particles; and that, also, of which the smallest quantity, when spread upon the same space of ground in soils of equal quality, will the soonest burn up the surface of the grass. We may also add, upon the authority of Sir Humphry Davy, that lime, when slaked with sea-water, has been used in some cases with considerably more benefit than when wetted in the common manner.

The benefit which might be derived from the union of a slight portion of chemical skill with agricultural knowledge is perhaps incalculable. The present state of education among the generality of farmers is not such, however, as to enable them to reap much advantage from scientific experiments, and even chemists rarely have opportunities of applying their art to practical purposes of this kind. It may, however, prove useful to some to offer a few brief directions for the analysis of lime, which we extract from the recent work of Dr. Henry:—

'To determine the purity of lime, let a given weight be dissolved in diluted muriatic acid. Let a little excess of acid be added, that no portion may remain undissolved owing the deficiency of the solvent. Dilute with distilled water; let the insoluble part, if any, subside, and the clear liquor be decanted. Wash the sediment with further portions of water, and pour it upon a filter, previously weighed. Dry the filter, and ascertain its increase of weight, which will indicate how much insoluble matter the quantity of lime submitted to experiment contained. It is easy to judge, by the external qualities of the insoluble portion, whether argillaceous earth abounds in its composition*.'

The presence of *magnesia* in limestone has been considered pernicious to vegetation when burnt into lime. It had been long known to farmers in the neighborhood of Doncaster, and other parts of Yorkshire, Derby and Nottingham, that lime made from a peculiar species of limestone injured their crops, and that made from the Breedon limestone, in Leicestershire, which there goes under the denomination of 'hot lime,' is so powerful, that it is there seldom used in larger quantities than from 25 to 30 bushels an acre, unless the land be very rich. A series of experiments were made upon the former by Mr. Tennant, who discovered that it contained magnesia, and on mixing some calcined pure magnesia with earth, in which he sowed different kinds of seeds, he found that they either died or vegetated very imperfectly; he therefore came to the conclusion that its effects were prejudicial. This is thought to have been occasioned by its retaining its caustic quality longer than pure lime; and that, if used to excess, it has a poisonous effect on vegetables, though, 'on poor soils,' it has been said, neither to receive water so rapidly, nor to part with it so freely, as lime;

*More detailed information on the mode of pursuing experiments on lime may be obtained from Anderson's Essays, Essay vi. part ii. sect. 11, 12 and 13, p. 88, from the substance of which the foregoing is chiefly extracted. Our farming readers will also find an ample discussion regarding the analysis of lime, in the following volumes of the Farmer's Magazine, v. pp. 27, 265, 451; vi. pp. 11, 192, 312, 316; vii. pp. 26, 33, and in Sir Humphry Davy's 7th lecture.

* Elements of Experimental Chemistry, 10th edit., vol. ii. chap. xv. sect. iii.

and in this respect it seems to hold an intermediate property between lime and clay*.' Experiments have also been made by Sir Humphry Davy and other chemists, from which it may be collected that, although, when calcined, as lime, it may become pernicious to land, if laid on in too large quantities, yet that, in its mild state, it is a useful constituent of soils. One of the most fertile parts of Cornwall, in the neighborhood of the Lizard, is a district in which the land abounds in magnesian earth. It is, indeed, one of the mildest absorbents with which we are acquainted, and upon ground which is infested with sorrel, its application is an immediate remedy. Magnesian limestone is usually of a pale yellow or brown color, and is found in many parts of England, as well as Ireland: it effervesces when plunged in acid, though it only dissolves slowly.

Its analysis requires a process too tedious to be here stated, but its existence in lime, in a pure state, may be ascertained by the following test:

Having taken out all the mineral oxide, next pour into the fluid a solution of neutralized carbonate of potassa, continuing to do so until it will effervesce no longer, and until both the test and smell of the mixture indicate an excess of alkaline salt. The precipitate that falls down is carbonate of lime: it must be collected on the filter, and dried at a heat below that of redness.

The remaining fluid must then be boiled for a quarter of an hour, when the magnesia, if any exist, will be thrown down combined with carbonic acid.

The *quantity of lime* to be applied to the land must of course be apportioned to the quality of the former, as well as to the nature and the condition of the soil: which considerations must also be in a great degree governed by the expense. There is perhaps no country where it has been used to such an extent as in the improved parts of Scotland, where it is often carried to the distance of twenty to thirty miles, after having been imported from distant points of the coast, and even from Ireland; and although it has been laid on at prices, varying in proportion to its strength, and the charge of burning, from 6*s*. to 18*s*. per chaldron of 36 bushels†, besides the cost of carriage, and in quantities according to the nature of the soil, yet the improvement has, in most places of its first application, borne out the charge‡. In Ireland, Chief Baron Foster has gone so far as 300 barrels, with manifest good effect. It is in that country, indeed, not uncommonly applied at the rate of 400 bushels per imperial acre; and immense crops of potatoes have been raised by its being laid upon strong old leys broken up in July or August, and allowed to remain in that state until ploughed again in the spring. It has been laid on some of the moors in Derbyshire to the amount of 1500 bushels§. Dr. Anderson says that 'he has himself had experience of it in all proportions, from 100 to above 700 bushels to the acre, upon a great variety of soils; and that he always found its effects in promoting the fertility of the soil to have been in proportion to the quantity employed, other circumstances being alike‖; yet an instance is mentioned, in the Nottingham Report, of twenty chaldrons, or 720 bushels, having been laid upon an acre of cold clay soil, without any benefit whatever. Experiments have also been tried of its application on heavy land, extremely retentive of moisture, to the extent of 300, 450, and 550 bushels, which, after eight scccessive years, showed no perceptible difference arising from the quantity laid on¶, and similar instances are too numerous to require mention; but these failures may, not improbably, have been occasioned by the imperfect state of the drainage. Lime has, however, been on so many occasions used at random, without inquiry being made or attention paid to the state of the land,—whether it has been over-cropped and worn out, or has been left under pasture and enriched by dung,—that, without regard to these particulars, much money has been uselessly expended, and many attempts at improvement have been rendered unsuccessful. A system also prevails in the cultivation of many estates in various parts of the kingdom, under which the tenants are bound by their leases to fallow the land at fixed periods, and to dress the fallows with a certain quantity of lime*; which being thus repeated when the condition of the ground does not always require it, it necessarily follows that no beneficial result can be attained.

Such, indeed, is the variety of soils and circumstances, that no general rule can be devised for fixing the quantity of lime that may be properly laid upon an acre of land. The various accounts from the different county surveys, and other sources of

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* Russell's Practical and Chemical Agriculture p. 37.

† Sir J. Sinclair states the average throughout Scotland at 6*d*. per bushel. Code of Agric., 3rd edit., p. 232: but excellent lime, made from chalk, can be delivered at the wharfs in London at 4*d*., or, if made out of limestone, in which case it is called *grain-lime*, at 5*d*.; and if taken at the kilns upon the Thames and Medway, at about three shillings per chaldron less.—We learn, however, from a recent account of the state of agriculture in the Vale of Forth, that lime is regularly sold at Alloa, Stirling, and other places where there are quarries, at 2*s*. 6*d*. per computed boll, peas measure. From 30 to 36 bolls, or 120 to 140 bushels, being generally laid on a fallow; or, if dunged, from 15 to 20 tons per acre.—Prize Essays and Transactions of the Highl. Soc. of Scotland, vol. iv. p. 17.

‡ In Scotland it appears that 192 bushels of lime-shells per Scotch acre (equal to 153 per imperial acre) have been applied with succcess on light soft land.—From 240 to 360 are however generally esteemed proper for different degrees of clay. From that quantity up to 600 bushels have been laid with good effect on strong land, both arable and under good grass; but it seems generally agreed, that from 300 to 480 bushels are quite sufficient for the greater part of the most fertile districts in that country; and light soils, which requires less in the first instance, are said to have been greatly benefited by a frequent repetition.—General Report, vol. ii. p. 533.

§ Arthur Young's Essay on Manures, in the Papers of the Bath Agricultural Society, vol. x. p. 122; and Tour in Ireland, 8vo, 2d edit., vol. i. pp 6, 121, 363: Tyrone Survey, p. 111; Derby Report, vol. ii. p. 437.

‖ Essay on Agriculture, 4th edit., vol. i. p. 521.

¶ Wright's Scottish Husbandry, vol. ii. p. 154.

* On some estates in the Weald of Kent, the tenants are bound to lay 100 bushels of lime per acre, on every recurrence of a fallow for wheat, which generally occurs every five years. Kent Rep. 2d edit. p. 98

information, state that from 80 to 180 bushels have been laid upon light soils with very palpable benefit, and that from 240 to 320 and even 400 bushels have been successfully applied to clays and strong grass land. It has indeed been found, that in maiden soils its use is so essential, on its first application, as to impart a permanent degree of fertility which could not be obtained by any other species of manure. In some parts of Scotland, which have been only of late years brought under an improved course of culture, and to which lime had not been previously applied, it was observed that the richest animal dung had but a weak effect upon the crops of grain. Peas, barley, and wheat, at first assumed the most promising appearance, but when the peas were in bloom, and the corn putting forth the ear, it was found that they dwindled away in nearly fruitless abortion—which, indeed, so far as the peas are concerned, ought not to excite surprise, for it is well known that they will not thrive in any soil which is not calcareous; yet the same ground, after getting a slight dressing of lime brought any kind of crop, that was adapted to the land and properly tilled, to full maturity.* Experience, indeed, proves that a certain portion of lime is necessary to bring all soils into a due state of fertility; bnt when they are once saturated with lime, or have got a sufficient quantity, whatever more is added only occasions useless expense.†—Many farmers have also learned, to their cost, that land which has received a complete liming should be either rested from severe cropping, or, after some short time, laid down to pasture. This, however, being not always convenient, the alternate system of husbandry should be adopted, even with the addition of a second year under clover, if the land be poor, and the green crops expended on the ground; and in no case should the soil be deprived of the usual dressings of dung.‡

In whatever quantity it may be employed, it is indispensable that every particle of lime be intimately blended with the soil; for if that condition be not complied with, its power upon the land will be so far lost as that operation may have been ineffectually performed. Although specifically lighter than any soil, it is, however, very commonly left in small lumps, which then fall into the bottom of the open furrow when the land is ploughed, and there remaining below the staple of the land, it naturally becomes useless for the purposes of the farmer; the operation therefore demands the most minute attention. When the lime, which may have been spread upon the ground, has been either already ploughed under, or only harrowed in, or both, it should be again harrowed and afterwards ploughed in. This must, however, be done as superficially as possible, in order to avoid burying the lime; and perhaps the best implement for that purpose is a scarifier, or one of the many scufflers now in use, as they mix the lime with the soil more effectually than can be done by the plough. The land must then be again harrowed and ploughed; but still not to a great depth; and in this manner it should get at least three ploughings and harrowings, if the soil be light, and four, or even five, according to the condition of the land, if it should be heavy: but, we repeat, that in no case should the lime be suffered to sink deep into the ground. We have indeed, on this, the evidence of Mr. Dawson, of Frogden, which, after the experience of upwards of half a century, is too well known and too highly appreciated to admit of doubt, that in every instance, upon his own land, in which lime was only harrowed in, when laid up for pasture, the ground not only continued, for upwards of thirty years, to produce the fine grasses, but, when ploughed down, those parts of the soil which were not sufficiently mixed with lime, though sown with clover, became gradually covered with bent; and he also adds his testimony, that, when properly mixed with lime, the effects of dung are not only greater, but much more permanent, whether under the tillage or pasture*. It should, however, be observed, that the depth of the ploughing may also be made to depend, in a great degree, upon the quantity of lime that is used, as well as upon the state of the soil; for not only is a less portion of calcareous manure requisite upon sands than upon clays, but as it sooner sinks into the former than into the latter, and the object is to keep a sufficient quantity mixed with the surface, it cannot, in that case, be ploughed with too shallow a furrow.

This renders a clear and well-wrought fallow absolutely necessary; but in this manner; if the lime be laid in the full quantity upon the proper soil, and if the future cultivation and manuring with putrescent matter be in all respects carefully conducted, it will produce the expected effect upon the land, the amelioration of which will last for a series of years. This mode of application is approved by the most enlightened farmers; yet there are many who affirm that grass-land forms the best bed for the reception of lime. When grass-land is broken up, it is however very generally full of weeds, which nothing but a complete summer fallow can thoroughly conquer; but if the land be clean, and the lime can be got forward in time, the application may in many cases prove successful.

Amongst numberless accounts of the effects of lime upon a variety of soils, we extract the following minute details of a series of experiments carried on during a period of twenty years upon a large farm in the north by a most intelligent man, the accuracy of whose statement appears to be entitled to the most entire confidence, and from which, if attentively considered, some useful information may be gleaned. The several fields thus operated upon were—

No. 1.—Soil composed chiefly of thin clay, some of it mixed with peat, and the whole incumbent upon a subsoil retentive of moisture: it had been in grass for several years, but yielded very poor returns.

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*It has been stated, in the General Report of Scotland, that soils of tolerable quality, in Lammermuir, only produce middling crops of oats and rye, and that the richest dung does not enable them to bring any other grain to maturity; yet the same soils, after being limed well, under proper culture, ripen every species of corn.—Vol. ii. p. 535. The same effect is stated to have occurred on the Mendip hills, in Somersetshire, in Hereford, and Derbyshire, and various other counties. See the Reports of Somerset, p. 512; Hereford, p. 57; and Derby, vol. ii. pp. 38, 401.

† Bailey's Survey of Durham, p. 209.

‡ General Report of Scotland, vol. ii. pp. 505 and 534.

* Letter from Mr. Dawson to the Editor of the Farmer's Magazine, vol. xii. p. 69.

The mode of cultivation pursued was this. The land was fallowed without taking any corn crop, and the lime was applied in a perfectly effete state during the following spring, at the rate of 220 bushels per imperial acre. The crop was oats: but little benefit was discovered from the lime until the following year, when the soil began to ferment, which showed that the lime was then in action. It was then sown with flax, the crop of which, both in flax and seed, was excellent. This was followed by peas, which returned a great bulk of haulm, but not much grain: the clay part of the land was now, however, quite loose and free, while the peat seemed more compact and firm. The field was then sown with red wheat, which turned out a very fine crop; and although it was not dunged until the ninth year, when it was thoroughly summer fallowed, the other crops continued good until it was laid down at the end of twelve years to pasture. Since that time, it has been a few years under corn; and though the produce of these crops cannot by any exertion be made to equal those preceding, yet the soil has been evidently much improved in every respect, when compared with its original state previous to the lime being applied.

No. 2.—This field, of nearly the same thin clay as the former, had been ill-treated by the preceding tenant, and was in a very exhausted state, though it is not stated that it had been previously limed. After being summer fallowed, it was laid down to pasture during several years; after which lime was applied to the sward during the winter months, and in the February following it was sown with oats. The crop was only middling, and in the six subsequent years it did not appear that much benefit was gained by the application. In the eighth year, however, the lime acted vigorously; a small part of the field, which had been left unlimed, being at least 50 per cent. inferior in crop, though the management was in every respect similar. It may, perhaps, be difficult to account for this cessation of action in the lime during this long period, though instances of a like nature are not unfrequent upon inferior soils; but it appears, from the statement of the cultivation, that a deeper ploughing had been given in the preceding season, by which no doubt, the lime was brought to the surface; and having, besides, been assisted by a copious application of dung, there can be little question that the difference between the crops was occasioned by the stimulus which was thus applied to the manure.

No. 3.—A real moorish soil, incumbent upon a close bottom which had been over-cropped, after lime, by a former tenant. This field was summer-fallowed, and limed with effete lime at the rate of 160 bushels per imperial acre. Oats were then sown; but the crop was poor, and after-attempts were not more successful. The stalk of the plant generally *singed* and decayed, after the strength of the seed-pickle was gone.

No. 4.—Of a similar soil, but rather superior in quality to the former—was fallowed out of grass, and the lime was applied hot from the kiln; but the effects were the same as those mentioned in the preceding instance. The oat-crop looked brisk at first, but decayed daily; and though dung was tried with a second fallow, and appeared to operate in a light degree, it yet did not repay the cost incurred. These two trials, which appear to have been very fairly made, clearly prove that land which is either poor in itself, or which has been worn out by the previous use of lime, will not pay the expense of a further application.

No. 5.—The soil of this field was a soft loam upon a wet bottom, which, though it did not appear to have been limed, yet was in a very exhausted state. It was, therefore, summer-fallowed after a crop of wheat, and quick-lime was laid upon it at the rate of nearly 200 bushels per imperial acre. This operated immediately; and at the expiration of sixteen years, during which time the land has been only three years in grass, its effects had not then ceased.

No. 6.—Was a strong loam, incumbent on clay which had consecutively carried five crops of grain after being ploughed from old grass. This field was dunged, as well as summer-fallowed; quick-lime was also laid on at the same rate as on the preceding, in the month of August, after which six ploughings were given. This, in less than a month, occasioned a fermentation of the soil, 'something similar to what is produced by yest upon unbaked bread.' In one respect, the improvement made upon this field by the lime was conspicuous: barley could with difficulty be raised upon it previous to its application, but afterwards fine crops of that grain were produced, and the ground was tilled with much greater facility than formerly, which is itself a sure token of amelioration in the soil.

No. 7.—Consisted of a heavy deep loam; some of it a strong, tenacious, red clay, but almost wholly incumbent upon a close bottom. It was ploughed from old grass, and sown with oats; was summer-fallowed in the ensuing yoar, and dressed with lime, which was mostly applied hot from the kiln, being drawn from the cart in regular-sized heaps of 5 pecks each, or thereabouts, and spread the moment it was slaked by rain or atmospherical moisture. About two-thirds of the field received 240 bushels per imperial acre, the remainder from about 280 to 340 bushels per acre. The whole answered well, and the entire operation appeared to be in direct proportion to the quantity applied; nor was there any distinction discernible in the effect of that which was laid on hot, though, as the season was remarkably wet, some of it was nearly in the state of mortar, and that there appeared an evident inferiority on some ridges on which quicklime had been spread in a windy day, which probably occasioned some of it to be carried off.

No. 8.—Was also chiefly loam, though of different qualities, and mostly incumbent upon a close bottom. This field, which consisted of 50 acres, had been cropped from time immemorial, and was so tired of carrying wheat, that it seemed scarcely worth ploughing. It was therefore laid down to grass by the in-coming tenant, and remained in that state during five years, when it was again broken up. Only 30 acres were limed, and this was laid upon the sward at the rate of nearly 160 bushels per imperial acre: but some of it was laid on three years before ploughing, some two years, and the remainder only a few days before the plough entered—part of it hot, and the remainder effete. No experiment could therefore have been better calculated to ascertain the different effects of lime upon the soil; yet throughout the whole field, even in the first year, they were nearly the

same; the crop was equally abundant wherever the lime had been applied, but strikingly inferior upon the 20 acres on which it had been omitted.

This would show that the application of lime to grass-land one or two years before it is broken up, as inculcated by several writers upon husbandry, is neither necessary to the soil, nor reconcilable with economy; as, in case of any declivity in the ground, much of the lime is washed off the surface by the rains, and lost before the land can be ploughed. It also proves that, in the trials just recorded, as well as in others upon the same farm, though not here mentioned, there was no visible difference between the application of quick-lime and that which was effete: added to which, there is this remarkable fact—'that much difference of opinion having prevailed relative to the quality of the limestone-quarries in the neighborhood, a trial was made of the lime from each of them upon six adjoining ridges of one of the fields—numbered 7. Though a difference to the eye was visible in almost every one of those samples, yet the effect upon the ground was in all of them precisely similar, nor could the most accurate judge say which was best. The quantity applied was in each case the same; and the operations of laying on the lime, spreading it, and ploughing the ground, were all carried on in a uniform manner.'*

On the best consideration which we can apply to this important subject, we should say—Let the farmer, as a primary ground for determination, well weigh the nature and the condition of his land, as well as the amount of the cost, previous to the application of a dressing of lime. If it is to be broken up from grass which has lain long in pasture, and without having been previously limed, and that he can afford the expense, let him lay on a round quantity at once; for if it be intended as a permanent alterative—a corrective and amendment of the properties of the soil—it should get a full dose, and anything short of that will be found little better than money thrown away. But if it is to be applied to ground that has been under tillage, and upon which lime has been previously laid, it can then only be used with advantage after a series of years have elapsed, and in small quantities; upon land also which has been kept under a proper rotation of husbandry, and has been regularly manured with stable-dung, bones, rape-dust, or other nutritious substances, upon which it may exert itself, as it will merely give increased effect to the riches which may have been thus added to the soil by superior management. In such cases, however, it may be usefully employed after every second or third dunging; for whether it be owing to an imperfect fermentation, or to whatever cause, it is certain that a portion of all the dung which is laid upon ground remains nearly in a dormant state until forced into activity by the application of some alkaline or calcareous matter.

On all land it decomposes nutritive matter, which may be supposed to lie otherwise in an inert or apparently insoluble state: it is advantageous on sands, because, so long as it remains well mixed with the soil, it attracts moisture from the air, which prevents them from burning; and if applied to clays, or other deep soils on which no calcareous manure has been previously laid, it renders them less cohesive, and more easily penetrable by vegetable fibres.* On calcareous soils it necessarily has but little effect, because it here already forms a part of the matter of which they are composed; but when laid on grass-land as a top dressing, it has greatly improved every species of soil, and has promoted the growth of the finer grasses; thus adding to the luxuriance of the herbage, and augmenting the productive powers of the soil when afterwards ploughed for grain.† As lime however—notwithstanding the fact which has been just recorded regarding the similarity of its effects—whether mild or quick—yet differs materially in its strength, inquiry should always be made on that point previous to its application. The following general rules may be taken as a summary of what has been already stated.

1st. Before the application of lime, the land should be thoroughly drained and laid dry.

2ndly. It may be carried on whenever the teams are the most at leisure; but summer is the best season, and it never should be laid upon the land unless in dry weather.

3rdly. It should be laid on while in a powdery state—the drier the better—and kept as near the surface as possible, as then best adapted to mix intimately with the soil.

4thly. It may be applied either quick or effete; but if in the former state, it will have more effect in the cleansing of the land, and a less quantity will serve the immediate purpose. It should, however, be carted upon the land as soon as possible, and spread directly before the plough, letting that follow so quickly, as that the body of the lime shall be slaked in the soil; and it must be cautiously applied to light soils.

5thly. As it has a tendency to sink into the ground, and it is important to preserve it near the surface, it should be ploughed with a shallow furrow.

6thly. When found, after a few years, in lumps, and much below the surface of the land,

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* Those who may wish for further details regarding these experiments are referred to the third volume of the Farmers' Magazine, pp. 77, 325. The numbers in this account are not however placed in the same order as that statement, but are classed according to the particular nature of the soils.

* Thus, among numberless instances of its effects upon land of the latter description, one is mentioned, in an account lately published of a farm in Ross-shire, which, under former management, produced such scanty crops of oats, that they scarcely paid the expense of cutting; yet in the following year, the same ground—having had 200 bushels of lime applied for the first time, together with 12 tons of farm-yard manure—yielded at the rate of 40 bushels of wheat per acre. This might, indeed, have been ascribed to the dung, as well as to improved culture; but another field, of the same kind of land, produced 36 bushels, solely with the application of lime, without any dung.—Library of Useful Knowledge, Farmer's Series, No. 18, p. 91.

† Calcareous soils have also been found to possess the advantage of guarding the sheep which graze upon them from the rot; and there can be no doubt that the application of lime, if accompanied by proper drainage, will materially assist in producing properties of corresponding efficacy. It is likewise known to be a great preventive, when lain upon pasture-land, of that destructive disease the foot-rot.

it should be ploughed up and repeatedly harrowed, so as to ensure its intermixture.

7thly. Clays and strong loams require a full dose; but for sands and other light soils, chalk, or a much less quantity of lime, will serve—each in proportion to the strength of the lime and of the land.

8thly. If the land be not supplied with the same quantity of putrescent manure that is usually laid upon other soils, the crops will suffer; and if it be not then laid down to grass for a long series of years, it will be worn out and exhausted.

[To be continued.]

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## DESCRIPTION, AND STATEMENT OF THE INGREDIENTS, OF THE EARTH IMPROPERLY CALLED "MARL" IN NEW JERSEY.

Extract from *Medical and Physical Researches*, by Dr. RICHARD HARLAN.

[It is feared that many of our readers think that we have been disposed to supply them, in unnecessary profusion, with information on *Marl*, and its use as manure. Yet, however copious may have been the supplies of information furnished directly from our own observations, or gathered from those of others—and however successful may have been, in some respects, these efforts to instruct, there are still other branches of this extensive subject, on which almost nothing is yet perfectly understood—and in regard to which most of the many publications that have been made, have served to increase, rather than to dispel the obscurity which envelopes the subject. We allude to the earth improperly called "*Marl*" in New Jersey—called "green sand" by geologists, and to which (long before we had ever heard of the latter term,) we affixed the (equally improper) name of "gypseous earth," in 1817, when we discovered its existence in great quantity in the banks of James River, Virginia, and contended for its identity with the earth called "marl" in New Jersey.* It was not until the appearance of the first communication on green sand in Virginia, from Professor W. B. Rogers, (p. 129, of vol. II. Far. Reg.) that any share of public attention was attracted to this subject, south of New Jersey. Since then, much interest has been felt and expressed, in Virginia and Maryland, and much informatiom, scientific and practical, has been furnished by Professor Rogers and others: but still we repeat that almost nothing is yet known as to the cause of the mysterious operation of this substance—and that much misunderstanding and delusion have been caused by improperly comprehending (in common parlance) this and other very different substances, under the one general name of "*marl*." In the *Essay on Calcareous Manures*, much was said upon the then existing and very great confusion and obscurity caused by this term being applied to manures of different chemical composition, and of different modes of operation. But since that work was published, the confusion of ideas, and of substances of different kinds, has been made still worse, by the "green sand" or Jersey earth," becoming known, as existing extensively on Virginia and Maryland, and by its being also called *marl*, whether destitute of carbonate of lime, or mixed with shells or calcareous matter. The *Essay on Calcareous Manures* treats of that "marl" of which the sole, or at least the principal ingredient, acting as manure, is *calcareous earth*, or *carbonate of lime*. It mentions other ingredients, and among them "green sand" as sometimes found in marl, and adding to their value—but considers these as accidental exceptions to the general rule—and professes neither to explain nor to discuss the mode of operation of these accidental ingredients.* Still we frequently find that our correspondents, and other readers of the Essay, confound the marl there treated of, with the "green sand," even when the latter contains not a particle of carbonate of lime—and more often, they draw no distinction between the former in a pure state, and the calcareous marl having a large admixture of the green sand," and thereby greatly improved in its value, and altered in its action as manure—though, as we think, the cause of that action has not yet been accounted for. Professor Rogers, in his several interesting communications to the Farmers' Register, on this subject, seems to attribute the wonderful effect of this manure principally, if not entirely, to the potash which it contains. This inference (from the analysis there stated) is plausible, (as there is no other *known* fertilizing ingredient,) and would be conclusive, if potash was always present, and in sufficient quantity. But we more than distrust this explanation—because, according to our personal experience, the green sand, though sometimes producing wonderful effects, has generally been but of transient and light value--and never worth using, *except on soils made calcareous* at the same time, or previously. Our distrust is strengthened by the following extracts from the lately published work of Dr. Harlan. By the analyses here stated, neither of the specimens of the two great classes of the "Jersey Marl" contain any proportion of potash. They also furnish new evidences (in addition to the many exhibited before in this journal) that the value, as manure, is not attributable, in any degree, to *lime*—for there is but little more than 1 per cent. of lime in the specimen of what is called "fertilizing marl," and not a trace of it in the "non-fertilizing."

We are very far from meaning to speak slightingly of the "green sand marl" as manure. Its effects in numerous particular cases (though far from universally,) have certainly been not only highly valuable, but wonderful—and the investigation of the mysterious action of this manure strongly invites the continued researches of scientific men—and from the result of such researches, we may hope for most valuable instruction to farmers, and much improvement and profit to agriculture. But we maintain, that no satisfactory explanation of these effects has yet been given—and we warn our readers against confounding the effects and mode of operation of *calcareous marl*, as manure, with those of the *green sand*, whether alone, or combined by nature, or by art, with calcareous manures.

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* See article on the Gypseous Earth of James River, No. 4. Vol I, Far. Reg. and p. 105 of Essay on Cal. Manures, 2d. Ed.

*Essay on Cal. Manures, 2d. Ed. pp. 48, 49, 68 and 92.

The following extracts form a part only of a longer communication to the Academy of Natural Sciences by Dr. Harlan, on the Fossil Remains, and Geology of New Jersey, and which we have first seen published in his late and splendid work.]

At various times there have been presented to the Academy specimens of fossil bones, principally from the state of New Jersey; which have not been hitherto described or noticed. I have undertaken to describe such as are most rare and interesting, and whose characters remain, in some degree, undefaced.

It will be necessary, in the first place, to offer a few remarks concerning the formation in which these fossils occur; in doing which, I shall content myself with the bare mention of the fossil *testaceæ*, some of which occur in immense numbers. For a knowledge of these, I am indebted to a gentleman eminently qualified to do the subject entire justice, and from whom we may anticipate I hope, very shortly, a full and accurate description of these very interesting remains; it is almost unnecessary to state, the naturalist alluded to is Mr. T. Say, who, together with Mr. T. Peale and myself, have lately returned from a short excursion to the marl-pits of New Jersey.* We were much assisted in our investigations by Dr. Samuel L. Howell, of New Jersey, who politely offered to accompany us, and whose knowledge of the country was peculiarly serviceable.

All that part of the state, denominated West Jersey, and which is included between Trenton and the Delaware Bay, on the north and south, and between the Atlantic ocean and Delaware river, on the east and west, is of oceanic or secondary formation, interspersed with patches of tertiary. The surface is composed chiefly of sand, occasionally of gravel, and very seldom of clay; not unfrequently of all three mixed.

This circumstance, in connexion with a knowledge of the nature of the substance improperly termed *marl*, will explain the vague and contradictory opinions of the farmers, respecting the manuring qualities of this earth; some of whom informed me, they considered a load of this *marl* equal to a load of *dung*. Others thought, that although the *marl* enriched the land, and made it more productive the first year, it subsequently produced an impoverishing effect on the soil. Others again declared, that though they had frequently made the experiment, they always found the marl absolutely injurious; and this depends, in fact, on the quality of marl used.

The fact is, that this earth possesses no more claim to the title of *marl*, than any other earth in which fossil testaceæ abound; generally speaking, it is little more than a ferruginous sand. Quantities of pyrites are also found to exist, almost universally; sometimes constituting the casts of shells, at others, filling the cavities of bones; and to the prevalence of which may be attributed the imperfect state in which the organic remains are generally discovered, and the very great rapidity with which they decay on exposure to the atmosphere, unless they are varnished, or other means are used to prevent the access of the air.

It is, further, to the prevalence of pyrites we must refer the injurious effects of the "*marl*," when spread too thick upon the soil, when, on the other hand, if mixed sparingly with new soil, it destroys or reduces to earth the fibrous matter, and thus proves highly beneficial as a manure. Should the soil be composed almost entirely of loose sand, (as it frequently is) the clay, which is a principal constituent of some of the "*marl-pits*" will give consistency to the soil, and enables the vegetables to take root; in which sense it may be said to act as a manure.

Not unfrequently whole strata or beds of this *marl* will occur without a single fossil, of a loose friable structure and moist nature, more or less granulated, and of various colors, but most commonly of a dark slate-black or greenish color; and has been by some supposed to consist chiefly of decomposed organic remains—but how erroneous is this opinion, will be clearly comprehended by the analysis of this earth, furnished some years ago by Mr. Henry Seybert of this city. (Vid. Cleaveland's Min. and Geol. 2d ed.)

| | |
|---|---|
| Silex, - - - - | 49.83 |
| Alumine - - - - | 6.00 |
| Magnesia - - - - | 1.83 |
| Potash - - - - | 10.12 |
| Water - - - - | 9.80 |
| Protoxide of Iron - - | 21.53 |
| Loss - - - - | 69 |
| | 100.00 |

This specimen of "*green earth*" or the supposed Marl, was from Rancocus creek; the quantities of its constituent parts, no doubt, vary with the locality. It constitutes, in almost every instance, the matrix of the fossil reliquiæ, of which the Terebratula and Ostrea occur in the greatest profusion, sometimes commingled, at others in nearly distinct beds, as at Mullica hills and Blackwood town mills. At the county poor-house we examined a creek, at the bottom of which were beds of fossil Ostreæ, and a few *rolled* specimens of Favosite and Fistularia, together with broken Belemnities; occasionally we observed some of the beds composed of Ostreæ, Belemnities, Terebratula, &c. heaped together in every direction and position, conglomerated together by the green sand, and quartz pebbles, scarcely any of the remains preserved entire.*

I have been indebted to Mr. A. Seidler, an experienced operative chemist, for an accurate analysis of the fertilizing and non-fertilizing varieties of "marl," the former of which is now extensively used in New Jersey as a manure.

*Chemical Analysis of the green fertilizing marl from New Jersey, dug from Lewellyn's Pit.* By A. Seidler. November, 1835.

This mineral appears as a greyish-green granular mass, in which, by aid of the lens, small particles of a shining lustre are discernible. By ex-

* Since Mr. Say first commenced the description of the New Jersey fossils, numerous investigators have entered this field of science. The communications of Messrs. Vanuxem, Conrad, Lea, Morton, Van Rensellaer, Dekay, &c., in the Journal of the Acad. Nat. Sc. and N. York Lyc. of Nat. Hist. will be consulted with interest. The present essay was originally communicated to the Acad. Nat. Sc. Philad. in May, 1824.

* The "marl" from Rancocus creek has been ascertained to be of the non-fertilizing species; the fertilizing variety, or shell marl, does not occur at that locality.

posure to a moderate red heat, it loses its greenish colour, together with a part of its weight, and the former is changed into a light brown, intermixed with grey. With borax, before the blow-pipe, it melts into a blackish slaggy globule of considerable hardness. It does not effervesce with acids; its specific gravity is 1.485.

*Experiment, No.* 1.

Five hundred grains of this mineral were carefully heated in a small glass retort until red hot; its colour changed as above stated, and after having cooled, its weight amounted to four hundred and eighty grains. During this process no gas (carbonic acid) was disengaged, but in the tube of the retort and the adopter a quantity of water was condensed, whose weight nearly corresponded to the above loss. We may, therefore, consider this mineral as a hydrate, or a compound of hydrates.

*Experiment, No.* 2.

The above four hundred and eighty grains, finely pulverized, were boiled in a matrass with a long neck, for several hours, with nitro-muriatic acid, consisting of five parts muriatic acid of fifteen degrees Baumé, and one of nitric acid of thirty-five degrees.*

Again.—A considerable part of the mineral was dissolved, but the brown colour had not disappeared; the solution was set aside for twenty-four hours, and the yellowish solution decanted from the sediment and again treated for several hours with a new addition of nitro-muriatic acid. The color of the mineral had disappeared considerably more, but was not altogether white: therefore, it was set aside again for twenty-four hours, and then decanted, a new portion of acid added, and treated again as above.

After one hour's boiling, the colour had completely changed, and appeared perfectly *white*. The matrass was removed from the fire, and the liquid allowed to subside; after having decanted the same, the residue was washed with distilled water until perfectly insipid; the residue, gathered on a filter and well dried, at 170 degrees, weighed 277½ *grains*, and proved to be silex.

*Experiment, No.* 3.

All the clear decanted solutions of experiment No. 2, which were of a yellow wine colour, were heated gently in a matrass, and then saturated with caustic ammonia: a copious and voluminous brown precipitate issued; which was brought on a filter and perfectly edulcorated with warm distilled water.

This precipitate (anticipating that it consisted of alumina and oxyd of iron) was boiled in a silver vessel with five hundred grains of potash, and afterwards gently evaporated to dryness and exposed to a moderate red heat, re-dissolved and filtered. The brown residue on the filter copiously washed with distilled water, and dried at 170 degrees of heat, weighed 134 grains, and proved to be pure oxyd of iron.

*Experiment, No.* 4.

The alkaline solution of the foregoing experiment was saturated minutely with muriatic acid, and a voluminous white precipitate was formed, which proved to be pure alumina; after washing it copiously and drying, it weighed 62 grains.

*Experiment, No.* 5.

The remaining solution precipitated with ammonia in experiment No. 3, was examined further, and by adding oxalate of ammonia, a precipitate was formed, which, after it had been well washed and dried, weighed 14 grains, and showed all the properties of *oxalate of lime*, which, after destroying the acid by exposure to heat, left 6 grains of pure lime, which corresponds exactly with the proportions of this salt given in the chemical works.

*Experiment, No.* 6.

As it is a known fact that magnesia forms a triple combination with muriate of ammonia, which cannot be decomposed by potash, unless the ammonia is driven out in a higher temperature, the solution from which the oxalate of lime had been obtained, was mixed with a sufficient quantity of pure potash, heated and finally evaporated to dryness. The dry mass being now deprived of all the ammonia, was re-dissolved, but no precipitate made its appearance, even after standing over night: therefore it contained no magnesia.

*Conclusion.*

According to the foregoing experiments, this green marl is composed of

| | | | | |
|---|---|---|---|---|
| 277.50 | grains of | Silex. | Experiment No. | 2. |
| 234. | " | Oxyd of Iron. | " | 3. |
| 62. | " | Alumina. | " | 4. |
| 6. | " | Lime. | " | 5. |
| 20. | " | Water. | " | 1. |
| .50 | " | Loss. | | |
| 500 | | | | |

*Analysis of the non-fertilizing green marl from New Jersey, by A. Seidler.*

The external appearance of this mineral is of a dull olive green, granular, or rather consisting of crummy masses; which, by exposure to a slight red heat, loses its green color, and part of its weight, becoming of a blackish brown. It does not effervesce with acids: before the blow pipe it melts, with borax, into a slaggy globule. Specific gravity, 1.566.

*Experiment, No.* 1.

Five hundred grains of this mineral were heated in a small glass retort, long enough to change its color entirely; a quantity of water was condensed in the tube of the retort and adopter; it lost by this process thirty-one grains, the loss corresponding with the evaporation. The remaining 469 grains were boiled repeatedly in a long-neck glass matrass, with a mixture of five parts muriatic acid of 15°, and one part of nitric acid of 35°, Baumé, until its colour had entirely disappeared. The insoluble white residue, after copious washing with distilled water, and being well dried, weighed 277½ grains.

* These acids, as well as all other re-agents employed in this analysis, were chemically pure.

*Experiment No. 2.*

All the acid solutions and washings obtained in the foregoing experiments, were mixed together and saturated with pure ammonia. A voluminous brown precipitate ensued, and after it had been separated by the filter and well washed, was boiled in a silver vessel with 500 grains of pure potash dissolved in a sufficient quantity of water, and afterwards evaporated to dryness, and exposed to a gentle red heat for half an hour, and then again boiled with water repeatedly in order to dissolve the alkaline mass; then filtered; the brown insoluble residue on the filter being well washed in hot water and dried, weighed 135 grains, and proved to consist solely of oxyd of iron.

*Experiment No. 3.*

The neutral ammoniacal solution of No. 2, which remained after having separated the precipitate, was further examined, in order to detect lime, if any existed: a sufficient quantity of oxalate of ammonia was added and strongly agitated, and exposed to heat for half an hour; no precipitate was formed, even after repeated agitation, and twelve hours repose; the same result followed after adding phosphate of ammonia: consequently, lime formed no part of the mineral.

*Experiment, No. 4.*

The clear alkaline solution obtained in experiment No. 2, after the separation of the oxyd of iron, was accurately neutralized by pure muriatic acid: a white gelatinous precipitate was formed, which, after separation by the filter, and being well washed and dried, weighed 52½ grains, and proved to be pure alumine.

*Experiment, No. 5.*

To the remaining solution of experiment No. 3, after having tested it for lime, a sufficient quantity of pure potash was added, and the whole evaporated to dryness, by which process the ammonia was completely expelled. The remaining saline mass was re-dissolved in water, and appeared perfectly transparent; no trace of an insoluble substance could be discerned, even after twelve hours repose:—it consequently contained no magnesia.

*Conclusion.*

These experiments exhibit the following constituent parts of this non-fertilizing marl, viz:

| | | |
|---|---|---|
| Experiment No. 1, | 277.50 | Silex |
| 2, | 135. | Oxyd of Iron. |
| 4, | 55.50 | Alumine. |
| | 31. | Water. |
| | 499 | |
| Loss, | 1 | |
| | 500 | |

Besides the fossil reliquiæ above named, we may further add Ammonites, Rostellaria, Turbinolia, Arca, Pyrula, Pecten, Donax, and numerous others, together with the bones or teeth of cetacea, sharks, crocodiles, turtles, mosasaurus, &c., lignite, amber, phytolithites, roots of trees encrusted with pyrites, &c.



This very extensive formation, of which we are now treating, lines the coast for several hundreds of miles, commencing at the northern extremity of Long Island, and extending as far as the Gulf of Mexico; and borders immediately the primitive rocks on its northern and eastern limits.

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## DIFFERENCE OF THE GROWTH, CULTURE, AND PRODUCT OF GRAPE VINES, IN THE UNITED STATES, AND IN EUROPE. OSAGE ORANGE.

### Letter I.

To the Editor of the Farmers' Register.

*Columbia, S. C., April 20th*, 1836.

If you think the following is sufficiently interesting to fill a page of your excellent periodical, have the goodness to honor it by giving it room.

The comparing of the various objects of agriculture in different countries may lead to reflection and elicit improvements in the culture and mode of management. I was led to think on this subject by reading a very good book—"Journal of a recent visit to the principal vineyards of Spain and France &c., by James Busby, Esq."—This gentleman has visited those countries like a man of sense, and his observations are usually correct, as his descriptions of men and things are worthy of the utmost confidence. He has visited countries and persons which I knew well, and it gave me great pleasure to see him mention so truly, gentlemen who deserve all the praise he justly bestows on them. It also gives me great pleasure to have this opportunity to notice here in support of Mr. Busby's high character of Mr. Delisle, Professor of Botany, and Director of the *Jardin des Plantes* at Montpelier. This gentleman's urbanity and liberality to strangers are above all praise, and I have experienced both. Mr. Busby notices the very small size of the vines in Burgundy, Champagne, and elsewhere, and their being planted, frequently as near as from 15 to 20 inches apart, and even closer in some instances. This I knew perfectly well; but it nevertheless seems very strange when compared with the growth and large size of our vines in this country, even in very poor sandy soil. To show this more satisfactorily, I shall here give a rough description of the vines in my garden. My grape-vines, which I use chiefly for wine, cover one sixth part of an acre. They are 45 in number, viz. 37 of my Madeira, 6 of the Lenoir, and 2 of the Bland, all made into wine separately. They are trained so as to cover the flat top of a trellis 8 feet from the ground, and they very fully cover it, none of the foliage or fruit being allowed to grow below the top of the frame. The oldest of these vines were planted as cuttings 27 years ago, and some of them are very large. The largest of them covers almost entirely a space of 48 feet by 30 feet. Just above the ground it divides into 5 branches of the following respective dimensions in circumference: 11 inches, 8½, 8, 7½ and 7½ inches. This is of the kind known as Herbemont's Madeira, and is, most undoubtedly, an European vine. It is, by some persons in Charleston, called Burgundy grape, and is one of the principal vines cultivated in the French province of this name, as also in Champagne, &c. I think it is there called Pineau or Morillon, and is the

greatest bearer I ever have seen, and its fruit is equalled by few, and surpassed by still fewer, as a delicious grape for the table as well as for wine. This, then, is one of the vines ,which, in those provinces are planted as near as 15 or 20 inches from each other! What can cause this enormous difference in the growth of the same plant? It cannot be richness of soil; for in parts of France and Spain their vineyards are highly manured, and grow in a more genial soil, being highly calcareous. My soil is very light and sandy, and although the vines alluded to, as growing in my garden, are occasionally manured, yet it is by no means very rich; and at my farm, where the vines have only been manured at the time of planting them, and the soil there is very poor and sandy, they grow nearly as large as in my garden. I have noticed strangers sometimes look at the soil and the vines alternately, in the utmost surprise, not being able to realize in their minds, such a growth on such a soil. This is most certainly very strange, and we can scarcely conceive that such must be the sole effect of climate. Can it be really the effect of climate, or is there some other cause that we have not yet found out? It could not well be attributed to the mode of culture and training; for my first efforts were to cultivate and train the vine low as is done in France, allowing them more space, however, than is done there, for I expected a larger growth on account of the climate. I soon found it impossible to keep them down, for when they were from 6 to 12 years old, they would put out shoots in one summer 20 or 30 feet long, or even more. I was, therefore, obliged gradually to adopt my present mode of training. What can be the cause or causes of this enormous difference in the growth of the same plant? It must also be noticed there are several other kinds of French vines, particularly the white grapes, that never assume this great luxuriance. I have another, which is also said to be a Burgundy grape by persons who know to a certainty of its having been imported from France. This vine was called by a French gentleman, many years since, the "giant vine," on account of the great vigor of its growth. It makes a very good red wine; but I do not cultivate it much, because it is exceedingly liable to rot, much more so than my Madeira; though both are said to do well in the low part part of this State, principally in Charleston and Beaufort. If it really be so, I am much surprised that some one does not cultivate it on a large scale for wine; for its produce would there surpass any after production in profitableness, reaching, or even exceeding, 2000 gallons of wine per acre.

Now to compare the product of our gigantic vines with the dwarfish ones of France. Their crops seldom exceed 300 or 400 gallons per acre, very rarely, though sometimes reaching, however, to 1000 gallons. My vines rot much every summer, sometimes more, sometimes less, according to the season. The last was most unfavorable, and at least two-thirds of the grapes were lost by the rot. The remaining ones grow probably the larger for it, as the latter part of the season was very favorable. Now, notwithstanding all this loss by rot, I made from that sixth part of an acre in my garden 230 gallons of wine, which multiplied by 6 gives 1380 gallons as the produce of an acre similarly situated. The culture of the vine in this country is a most interesting subject, that deserves to be followed up with zeal by wealthy public spirited gentlemen, or more properly by public aid.

I had intended, sir, to give you the dimensions of several other of my vines; but my paper is so nearly filled up, that I have only room enough left to tell you that I have tested the truth of the article in the last No. of the Farmers' Register relative to the *maclura aurantiaca* (osage orange.) Silk-worms really feed freely on its leaves, and I have grafted it on the Chinese paper mulberry, (*Brousonetia,*) and roots of the common mulberry, with apparent full success. My good fri nd, T. S. P. having sent me seeds of this valuable tree, I planted them, and I have at least one hundred of them coming up finely. This is also a very interesting subject, which deserves the attention of the lover of his country.

N. HERBEMONT.

## Letter II.

The subject of *provignage* requires some explanation for those persons who are not acquainted with the culture of the vine in France. *Provignage* is usually nothing more than the practice known to all gardeners of laying a branch of a plant for the purpose of making it take root, and thus multiplying the subject. This word has, however, besides this, another, though analogous meaning, among the cultivators of the vine in Europe, and principally in Burgundy and Champagne. By it is also understood the singular and strange operation of laying down in a trench, not only the whole vine, but all the vines of a vineyard, leaving only the summits out of the earth. The object of this is to renew the vines without losing time, as the vines bear a crop the same year that the operation is performed. By this operation, all the vines of a vineyard will, after a number of years, be very far from the place where they were originally planted. I called this a strange operation; for, where a plant is in a soil and climate fully suited to its perfect success, this cannot be necessary, particularly for a plant, which like the vine, will live and thrive, in favorable circumstances, for several hundred years. This *provignage*, or laying of the whole plant. has been practised time immemorial; but it was only after a considerable number of years, when the vines really needed renewal. But it is now done in some parts of Champagne, as frequently as every three years. This being a very laborious and expensive operation, the advantages of it must have been very fully ascertained. The high prices of the wines produced in that country may warrant this expense; but it certainly would not do for the great bulk of the vine countries in Europe and elsewhere. The vine being there a very diminutive plant, compared with its natural exposition in more southern countries, renders this operation practicable; but it would be impossible with us, except with very few, if any of the least vigorous growers. With us, however, it is not necessary, for I feel confident that most of my vines are capable of living and thriving for several centuries, if suffered to do so. It would be a very wrong idea, to suppose that because our vines here are very extensive and large, that they must look old and decrepid. They are not at all so. They are, on the contrary, most luxuriant and fruitful. It is also proper to observe that their size is no obstacle to their being as closely pruned

as the short vines of Europe; for the pruning takes place on the growth of the preceding year; this may be cut as short as convenient or suitable. One of our large vines that covers a very great extent of ground, is, in reality, like a great number of plants of the size of the European ones, issuing from the old wood, instead of out of the ground. If the European writers on the subject are correct in supposing that old vines produce richer grapes than young ones, and that the sap becomes better elaborated by passing through the vessels of old wood, and the leaves of the young, our large vines must have a great advantage over the small ones. I have great doubt of the correctness of this principle; for they also say that the nearer the fruit is to the ground, the richer it is, and the better it ripens. This, although it appears irreconcilable with the other proposition, appears to be a well ascertained fact, that, in the colder parts of Europe, where the vine is cultivated, the grapes produced on arbors, and high-trained vines, are poorer in saccharine matter than those from the low vines of their vineyards. It is probable that the reason of this is, that, on the low vines, the heat reflected from the ground has a greater effect than on the high ones. In our climate, we have heat enough to reach to any height to which we may choose to train our vines.

The very great and praiseworthy industry and ingenuity of our European brothers, in converting a country most evidently very unfavorable for the growth of the vine, into one producing some of the highest priced wines in the word, shows that all we need, to insure success, is perseverence, and a number of experiments to ascertain, not merely the most suitable mode of cultivation, but also the most suitable kinds of vines for our purposes, as to hardiness and richness of fruit. I am now too old to make many more experiments on this most interesting subject; but others will follow who will probably be more successful. What would most undoubtedly be the very best way, would be to have those numerous experiments which require years to give the results, undertaken at the public expense. I have long labored in the vineyard unaided—but, on the contrary, discouraged by sneers, &c. But yet, if I have not had the most complete success, I have done something, and my labors will not be altogether lost. I shall persevere as long as I am able.

I continue to feed the few silk worms I have with the maclura at the same time as I give them also mulberry leaves, and I find that they feed indiscriminately on either of these plants. If there be any difference, it may be that they prefer the maclura. This subject may become very interesting, particularly if it be found that the latter plant is hardier, and resists late spring frosts better than the mulberry. N. HERBEMONT.

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From Chaptal's Chemistry applied to Agriculture.

## GENERAL VIEWS OF THE ATMOSPHERE, CONSIDERED IN ITS EFFECTS UPON VEGETATION.

[Continued from p. 58 ]

### *Of the Imponderable Fluids of the Atmosphere.*

Besides the ponderable substances which constitute the atmosphere, and those which are found in it accidentally, it receives some imponderable fluids, of which the effects are less known, but which appear to play an important part in the atmospheric phenomena: of this number is the electric fluid.

1. Electricity is developed by friction, and transmitted by simple contact. It is accumulated in bodies when they are insulated; and it is communicated in the same manner as heat, when bodies which are non-electric approach those which are electric.

The singular properties of electric fluid contaitained in the atmosphere, and the frequent variations which it undergoes, give rise to a numerous phenomena, for which observation and experiment enable us to account. When this fluid is abundantly diffused throughout the atmosphere, it exercises a powerful influence over vegetation, excites the action of oxygen, and determines the condensation of the aqueous fluid. Davy has observed that grain germinates more quickly in water charged with positive electricity, than in that which contains the opposite principle; and that it is a well known fact, that fermentation takes place most rapidly during a thunder-storm, and that a liquid, composed of a variety of principles not very closely united, milk for instance, is decomposed, and becomes acid under a highly electric state of the air.

2. Whatever may be the opinion we may adopt, as to the nature of the principle of heat, there can be no doubt that there exists in the atmosphere, and in all terrestrial bodies, an imponderable fluid, unequally imparted to them, and which renders their state solid, liquid, or gaseous, according as the affinity, existing between their particles and the fluid of heat, is more or less strong. It is this state which we regard as the natural state of bodies.

Exposed to an equal degree of atmospheric temperature, all bodies, in their natural state, are penetrated by unequal quantities of the fluid of heat; but as the fluid is in combination with the particles of the bodies, and thus forms one of their constituent principles, it does not develope its most important property, which is that of heat; and in this state it has been agreed to call it *caloric*; and it only takes the name of *heat* when it is free, and disengaged from all combination.

Caloric, interposed between the molecules of bodies, tends to separate them from each other; and when accumulated beyond its natural quantity, the excess acts as heat; changing the form of bodies, and causing them to pass from the solid to the liquid state, or from the last to that of vapor.

Those bodies which exist naturally in a gaseous state, and which are rendered solid by being brought into combination with other substances, return to their natural state as soon as a sufficient degree of heat is applied to destroy the force of the affinity which unites them to their base. But those which are not originally gaseous in their form, under the influence of heat pass through all the degrees intermediate between their natural state and that of imperceptible vapor; and return to the concrete state, when deprived of the excess of heat which had been applied to them.

Caloric can be extracted from bodies by percussion or compression, in the same manner as water is expressed from a substance which has imbibed it. When a body is deprived of its caloric by either of these means, the molecules composing it are brought closely to each other, and its porosity,

and consequently its volume, diminished. The act of striking, or rubbing hard bodies together, produces the same effect; the portion of caloric, which is in either case set free, acts as heat.

The temperature of bodies can be lowered, or elevated, by placing them in contact with other bodies more or less hot than themselves. The fluid of heat will pass from one to the other, and produce an equilibrium in their state, according to their respective capacities for caloric, which enable them to absorb unequal quantities of it.

All bodies in their natural state contain a determinate portion of caloric; but when their density undergoes a change, by the variations of temperature to which they are exposed, they lose or absorb caloric, in proportion to their contraction or dilation. The gases, which become solid by entering into combinations, the vapors which are condensed, the solids which are contracted, impart to the air a portion of their caloric, which becomes heat; whilst all these bodies, on receiving heat from the air, are dilated.

The phenomena of composition, and decomposition, which uninterruptedly renew the surface of our globe, give rise every moment to the emission or absorption of caloric. Two substances, entering into combination, form a compound which perhaps requires more or less caloric than is contained in the two component principles; and then either heat or cold is necessarily produced during the operation. Those gases, which become solid by entering into combination, part with their caloric whilst undergoing the change, and thus produce heat. In combustion, where oxygen is the principal agent, there is a constant disengagement of caloric, because that gas, in general, forms solid or liquid compounds with combustible substances; and it gives out a portion of the caloric which preserved it in its gaseous state.

These principles established, we can easily explain a part of the effects produced upon vegetation by the variations of temperature.

The changes of temperature, experienced by the atmosphere in the course of a year, are so great, as to cause some liquids to pass alternately either to the solid or aeriform state, and some solid bodies to become liquid. The natural effect of heat upon these bodies is, by dilating them, to weaken the force of cohesion which unites their molecules, and, by facilitating the action of chymical affinity, to enable them to enter into combination with foreign bodies. Thus heat renders the juices of plants more fluid, and facilitates their circulation through the cells and capillary vessels; and, by giving activity to the suckers of roots, enables them to draw from the earth the juices necessary for their nourishment.

Above a certain temperature, heat, by promoting evaporation, causes the juices of plants to become thickened and dried in their organs, and thus vegetation is arrested, and life suspended. This effect always takes place during great heats, when neither rain, dew, nor irrigation can sufficiently repair the loss occasioned by evaporation. This effect would be more frequent, if provident nature did not employ means to moderate the action of heat.

The first of these means is the transpiration of the vegetables themselves, which cannot take place without carrying off a large portion of heat, and thus preserving the transpiring body at a temperature below that of the air. The second means is found in the organization of leaves, which are the only parts of a plant where transpiration takes place. That surface of leaves which is exposed to the direct rays of the sun is covered by a thick epidermis, which resists the calorific rays. In herbaceous plants, as in the stalks of grasses, this covering is composed principally of silex. In other plants it is analogous to resin, wax, gum, or honey; whilst the epidermis, which covers the opposite sides of the leaves, is fine and transparent. It is by this, that transpiration and the absorption of nourishment from the atmosphere are carried on. If we should reverse the order of things, and present the under surface of a leaf to the rays of the sun, we should very soon see that it would make great efforts to resume its natural position.

When a plant is dead, or rather when an annual plant has fulfilled its destiny, giving assurance of its reproduction by the formation of its fruit, the action of heat and of the other chymical agents is no longer modified by any of the causes of which I have just spoken, and the plant receives their impression in an absolute and unmodified manner. When the temperature of the atmosphere sinks below a certain point, the fluids in plants become condensed, the movement of the juices is retarded, the activity of their organs languishes, and is at length suspended, until restored by the return of heat. The action of the atmosphere upon plants, when deprived of its due proportion of heat, is however modified by the emission or disengagement of caloric, which is always given out when liquids are condensed, or solids contracted; and this occasions the temperature of plants, during the winter, to be always a little higher than that of the atmosphere.

It sometimes happens that the temperature of the atmosphere sinks so low, as to produce fatal effects upon plants, by freezing their sap, and thus occasioning their death. This effect does not always depend upon the intensity or degree of cold to which they are exposed, but upon particular circumstances. I have seen olive trees resist a temperature of 22°.2 Fahrenheit, and perish from that of 28°.6; because in the last case the snow, which had collected upon the branches of the trees during a night, was dissolved the following day by the heat of sun, and the wet tree was exposed during the succeeding night to the action of 28°.6. There is nothing more dangerous for corn and grasses, than those frosts which follow immediately after a thaw, because the still wet plants, not being deeply rooted in the ground pulverized by the frost, have no means of defending themselves from the effects of the cold.

3. Sennebier was the first to admit that the influence of light was hurtful to the germination of seeds. Ingenhouz confirmed this opinion by actual experiment; but M. de Saussure, who caused grains to germinate under two receivers, the one opaque, and the other transparent, is convinced that germination took place in both cases at the same time; but that the subsequent vegetation was more rapid and vigorous under the transparent, than under the opaque receiver. It is easy to reconcile these opinions and results, though apparently so contradictory, by separating the action of heat from that of light. As plants transpire very little during their first stage of germina-

tion, if they are exposed to the united influence of the two fluids, that of heat will exercise upon them its full force, because there is no evaporation from them to temper its effects, and their delicate organs will be withered and dried up. It is for this reason that gardeners are so careful to shelter their nurseries from the rays of the sun, and not to expose their plants, till by the development of their leaves they are able to moderate the effects of heat by transpiration.

Though the action of light upon vegetation does not appear to be so important as that of the other fluids of which I have spoken, it is not in reality less so. Plants, which are raised in the shade or in the darkness, are nearly or quite without color, perfume, taste, or the firmness of texture of those that are exposed to the direct rays of the sun; and if the luminous fluid does not combine with the organs of plants, we cannot deny that it is a powerful auxiliary in their combinations.

It is generally acknowledged that plants do not emit oxygen gas, excepting when exposed to the direct rays of the sun; and it is known also that flowers rarely produce fruit, if raised entirely in the shade. According to the observations of M. Decandolle, the sensitive plant, if carried into the shade, closes its leaves as during the night, and re-opens them immediately upon being again exposed to the rays of the sun, or of a lamp.

The grand discoveries of Herschell have thrown great light upon these delicate questions. That learned philosopher has proved, that amongst the various rays constituting a pencil of light, there are some that possess nearly exclusively the property of being luminous, others, that of affording heat. Wollaston and Ritter have added to these important facts, that there exists a third species of rays, which appear to act upon bodies as powerful chemical agents.

When we reflect upon the influence which the atmosphere exercises over vegetation and over the principal operations which are carried on in rural establishments, such as fermentations, the preparation of various productions, and the decomposition of some substances, in order to apply them to particular purposes—we are astonished at finding nowhere any of the simple and unexpensive instruments which announce its changes every moment.

I do not propose that delicate or complicated instruments should be provided; but I wish to find on every farm an hygrometer, to ascertain the humidity of the atmosphere, a thermometer to indicate the changes of temperature, and a barometer to determine the weight of the atmosphere. This last instrument would be particularly valuable, as predicting the changes of the weather; the rising of the mercury announces the return of dry weather, and its sinking warns us of rain and storms. We can regard these variations but as signs; but they are signs much more certain than those which country people derive from the changes of the moon.

From the Hudson Republican.

### A PRODUCTIVE FARM.

To the Editor:—Wilt thou oblige the Agricultural Society of this county, by publishing the annexed extract from a letter addressed to Dr. J.P. Beekman, by Samuel T. Vary, of Kinderhook, giving a statement of the products of his farm.

It will be understood that the account is for sales actually made, and that he has retained sufficient grain and provisions for the winter's use; and has besides drawn his living from the farm during the year. The farm has 145 acres of land under cultivation. The soil is sand and fine gravel, sand and loam, and sand and clay.

*Sales and products of the farm for* 1835.

| | |
|---|---|
| 12 calves, - - - - | $37 89 |
| 196 lbs. butter, at 20 cts. - - | 39 20 |
| 1442 do. cheese, at 8 cts. - - - | 123 37 |
| 30 lambs, at $1 87½ cts. - - | 56 25 |
| 850 bush. oats, at 52 cts. - - - | 442 00 |
| 375 do. potatoes, at 25 cts - - | 93 75 |
| 20 tons of hay, at $15, - - - | 300 00 |
| 72 bush. onions, at 50 cts. - - | 36 00 |
| 500 do. corn, at 82 cts. - - - | 421 88 |
| 220 do. wheat, at $1 50, - - - | 330 00 |
| 4 cows, beef - - - - | 69 00 |
| 2 oxen and 2 steers, - - - | 130 00 |
| 7 shoats, - - - - | 17 00 |
| 1440 lbs. pork, at 7 cts. - - - | 100 80 |
| 22 wethers, at $4 - - - | 88 00 |
| | $2,285 13 |
| Deduct money paid out, | 383 75 |
| Net profit, | $1,901 38 |

If some of our active farmers would keep a similar account during the year, and also a written account of their agricultural experiments, and present them to be read at the winter meeting of the Agricultural Society, it would add much to the interest of those meetings, and very much extend the sphere of the society's usefulness. Such communications may be addressed to any officer of the society, or to

JOHN STANTON GOULD,
Corresponding Secretary, Stockport.
2*d month, (Feb.)*

From the Journal of Commerce.

### IMPORTATION OF AFRICAN ASSES.

Five large African male asses, of a nearly milk white color, were on Saturday landed from the brig Commaquid, which arrived here on Friday from Gibraltar. These animals are altogether unlike in appearance to the English ass or donkey, one of which may be occasionly seen here, and which is a diminutive little animal, and of very little use as a beast of burthen. The African ass is, on the contrary, as large as a middle sized horse, and has been, as far back as the days of scripture, an animal much prized for its useful qualities in Asia and Africa. The present importation—although there are probably asses enough already in the country—is likely to prove a valuable acquisition.

From the Tennessee Farmer.

### GROSS MISCONCEPTIONS AS TO THE NATURE AND VALUE OF AGRICULTURAL PAPERS.

Among a large portion of those who are engaged in agriculture, an idea prevails, that agricultural papers are only valuable as the means of conveying to the public that agricultural knowlege acquired

by their conductors, of which the rest of mankind are ignorant——Nothing can be more fallacious than such a notion, and it is one of a most pernicious tendency to the great cause of agricultural improvement, and, consequently, to the best interests of the country. True, the conductor of an agricultural paper, if a practical farmer, should, and if well qualified for his task, he will, feel that solicitude for the improvement of his occupation which will induce him, not only to reason and to reflect on the subject, but often to reduce to the infallible test of actual experiment, the suggestions of his own mind, as well as those which may be made by others. But were the promulgation of the knowledge thus acquired by a single individual, no matter how accomplished a farmer he might be, the only benefit to be derived from the persual of his paper, its beneficial influence would necessarily be confined within comparatively very narrow limits indeed. It must be reccollected that there are thousands in every civilized country on the globe, who are constantly engaged in efforts, by the same means, to acquire a more perfect knowledge of their profession, and who are every year contributing largely to the existing stock of agricultural knowledge. To disseminate as widely as possible, not only the new discoveries thus made by this vast number, both of scientific and practical farmers, and, what is perhaps of even still greater importance, to diffuse throughout the great mass of farmers the existing knowledge, now confined to a few, to illustrate the benefits, both public and private, which must result from reducing it generally to practice, and to urge on all engaged in agriculture the adoption of such a course, by appeals, not only to their patriotism, to their ambition for distinction in their profession, but to the still more powerful motive of self interest in most men. These are the great objects aimed at by agricultural papers—objects, to the attainment of which they are admirably adapted, and objects which they have actually accomplished to an immense extent in every country in which they have received an extent of patronage in any degree proportioned to their intrinsic value and high importance. Were this notoriously correct view of the subject generally entertained, self interest alone would effectually secure to agricultural publications, at least among farmers and planters, a far more general and extensive patronage than they have ever yet received, for it may be safely asserted, that while they are among the cheapest periodicals of the day, no farmer of common intelligence can regularly peruse an agricultural paper, conducted with ordinary ability, without being actually benefited, even in a pecuniary point of view, to an amount at least tenfold greater than the price of his subscription—besides the salutary and the almost incalculable benefit which the farmer's children cannot fail to derive from the intellectual and moral improvement produced by the reading of such a paper. The general circulation of such works should, therefore, be zealously promoted and encouraged, not only by the agricultural community, but by all who feel any interest in the welfare and prosperity of their country.

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### REMEDY FOR THE "MURRAIN" OR "CAROLINA DISTEMPER" IN CATTLE.

*Amelia, April 15th* 1836.

Take the boughs or twigs of common cedar, (those boughs having the most berries are to be preferred,) pack them in an iron pot or boiler as closely as you can—fill the vessel with water and boil it moderately until about half the quantity of water is boiled away—then let it stand one hour to cool. Give one quart of the tea by drenching the sick animal as we do a sick horse—repeat the dose every half hour until it operates. I have tried this remedy for the above disease, and with confidence recommend it to the citizens of Virginia where the cattle are subject to it. It operates as a very powerful diuretic as well as cathartic. I have relieved horses of violent attacks of stranguary by this cedar tea, when every other remedy had failed.

R. B.

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### PROMPT SUBSCRIPTION TO THE EASTERN SHORE RAILROAD.

"We learn (says the Richmond Compiler) that all the stock for the Eastern Shore Rail Road, has been taken in Philadelphia. This scheme proposes a connexion of Philadelphia, by means of a railway through Delaware, Maryland, and the Eastern Shore counties of Virginia, with the Portsmouth and Roanoke Rail Road. The completion of this magnificent work will add greatly to the trade and travel of the latter road, and will divert much of it from Baltimore."

This route is, for much of its length, on a ridge, and is one of many such lines presented in the tide water region of the Southern States, where nature has executed the grading, and better than art could possibly have effected it in any route across the course of streams. When the immense superior facilities of these level ridge-routes, are known and properly appreciated, there will be constructed on them numerous branch rail roads, any of which, if named *now*, would draw ridicule upon the proposer. Every ridge between adjacent streams in lower Virginia and North Carolina, is almost a perfect level: and for many miles on such ridges, the wooden railroads, for ordinary wheel carriages on Williams' plan, (described in Vol. I. Far. Reg.) might be constructed with pine timber cut down along the track, and which would serve to create means for cheap transportation, where none, or only the most laborious and costly, now exists, and thereby would give a new value to timber and all other heavy commodities, to the lands producing them, and to the business of the railroads, and to the market towns, to which there new products would be brought for transportation and for sale. Many tributary branches to both the Portsmouth and Petersburg railroads will yet be opened, which have not been proposed, and scarcely thought about.

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### FOWL LICE.

When confined, or when simply roosting, in an enclosed house, hens are apt to become infested with lice, in the warmer months. Dry wood ashes, put on the ground where they dust themselves, will very soon free them.

## REVIEWS OF NEW WORKS ON CALCAREOUS MANURES.

From Silliman's Journal of Science.

*Essay on Calcareous Manures, by* EDMUND RUFFIN. Second Edition. Shellbanks, Va., 1835. 8vo. pp. 116.

*On the use of Lime as a Manure, by* M. PUVIS, translated for the Farmers' Register. Shellbanks, Va., 1835.

There is no one of the useful arts to which the application of chemical science may be made of as much importance as to agriculture. We cannot indeed inquire in the minute and delicate processes by which nature elaborates the inert matters of the soil, and converts them into the living plant; but we can examine that organized vegetable, and find what elements enter into its composition, and by a similar examination of soils can determine whether they contain the substances from which the plant must obtain its growth, or not. If they do not, the addition which will be efficient in promoting the growth being thus determined, chemical researches will again show the source whence it can be derived in the most economical manner. So also soils may contain compounds which, if the proper food of some plants, may be noxious to others; chemistry will detect these, and point out the means of neutralizing their injurious action.

Instead then of the decreasing fertility of soils which political economists assume, in opposition to some well known facts, or which the general experience of our own country would seem to demonstrate, we might infer that good soils could be kept up to their original state, and inferior soils improved until they became equal to the best: that nothing in fact except climate would oppose a limit to the approach of agricultural product to the maximum.

Such results, however probable in appearance, have been far from being attained, or even approached. Agriculturists rarely take the trouble to learn even the elements of science, and if the direct force of obvious example occasionally leads to the introduction of new machines and improved processes which are merely mechanical, those which chemical science would indicate are rejected as unintelligible and visionary. On the other hand the student of science can rarely or never acquire the practical skill, the knowledge of the mode of performing and directing agricultural labor, on which the practical farmer properly prides himself, and without which the best theory will lead to no profitable result.

In the application of chemistry to the analysis of vegetables, chemists have usually neglected to examine substances of the greatest importance which they know to exist in them, but which they were willing to consider as merely adventitious. Thus the person who reads a treatise on general chemistry, may rise from its perusal in the belief that plants contain no other essential elements but carbon, hydrogen, and oxygen, with the occasional addition of nitrogen; while a course of actual experiment could show earthy and saline substances, of large amount, wholly neglected in the estimate. Phosphorus too, which forms so large a portion of the mass of those animals whose whole subsistence is derived from the vegetable kingdom, is never named* among the elements of vegetables, yet it has on some occasions been detected in them, and there can be no doubt that if it were diligently sought it must be found in almost every case. When the gigantic bones of the elephant are known to consist, to so great an extent, of phosphate of lime, it would be vain to deny that the phosphorus and calcium exist in some state or other in the herbage he feeds upon, as well as the oxygen which forms the other ingredient of the phosphate. So far in fact from those substances which are neglected by chemists being unimportant in the constitution of plants, they must modify the manner in which the other elements combine; and although the vital action does in many cases compel them to enter into combinations in direct opposition to the ordinary laws of chemical affinity, we may in many instances safely attribute the great difference which exists among compounds, said to be of the same elements, to the very matters that are usually rejected in the examination.

"It is said that putrescent manures serve for the nutriment of plants. But the same might be also stated in relation to substances which improve the soil, which furnish to it matters necessary to render it fertile; which impart to vegetables, the earth and saline compounds which enter as essential elements into their composition, texture, and their products. Such improving substances well deserve to be regarded as nutritive."

"Thus lime, marl, and all the calcareous compounds employed in agriculture, since they furnish to plants lime and its compounds, which sometimes form half of the fixed principles of vegetables, ought also to be considered as aliments, or, which comes to the same, as furnishing a part of the substance of vegetables. Thus, again, wood ashes, pounded bones, burnt bones, which furnish to vegetables the calcareous and alkaline phosphates which compose a sixth part of the fixed principles of the stalks, and three-fourths of their seeds, ought well to be considered, and surely are nutritive."

"What thus particularly marks the distinction between the manures which improve the soil (*amendemens*) and those which are alimentary (*engrais*) is, that the former furnish, for the greater part, the fixed principles of vegetables, the earths and salts, the latter the volatile matters which are abundantly diffused through the atmosphere, whence vegetables draw them by suitable organs: and what is more remarkable, is, that the vegetable by receiving the fixed principles of which it has need, acquires as we shall see, a greater energy to gather for its sustenance, the volatile principles which the atmosphere contains."—*Puvis.*

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* Probably the author refers to the necessary elements of plants, among the adventitious bodies; we believe it is usual to name the bodies which he has designated, e. g.—from a work now lying before us, take the following passage—"Besides the elements above named, that are essential to organized bodies, (carbon, oxygen, hydrogen, and nitrogen,) there are others, which are present in different cases, in greater or less quantity: such are phosphorus, sulphur, chlorine, iodine, bromine, potassium, sodium, calcium, silicium, magnesium, iron, manganase, &c. but generally they are in minute quantities," &c. Silliman's Chemistry, Vol. II. p. 391. Within these remarks, both organic kingdoms are included.—ED. J. OF S.

"The greater part of improving substances are calcareous compounds. Their effect is decided on all soils which do not contain lime, and we shall see that three-fourths, perhaps, of the lands of France are in that state. Soils not calcareous, whatever may be the culture, and whatever may be the quantity of manure lavished on them, are not suitable for all products, are often cold and moist, and are covered with weeds. Calcareous manures, by giving the lime that is wanting in such soils, complete their advantages, render the tillage more easy, destroy the weeds, and fit the soil for all products."

"These improving substances have been called *stimulants;* they have been thus designated because it was believed that their effect consisted only in stimulating the soil and the plants. This designation is faulty, because it would place these substances in a false point of view. It would make it seem that they brought nothing to the soil nor to plants, and yet their principal effect is to give to both, principles which are wanting."

Thus the main effect of calcareous manures proceeds from their giving on the one hand, to the soil the calcareous principle which it does not contain, and which is necessary to develope its full action on the atmosphere; and on the other hand, to vegetables, the quantity which they require of this principle, for their frame work, and for their intimate constitution. It would then be a better definition than that above, to say that to *improve* the soil, is to give to it the principles which it requires, and does not contain."—*Puvis.*

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"In the neighborhood of great cities, alimentary manures being furnished on good terms, may well vivify the soil; but animal manures cannot suffice but in a few situations and of small extent, and in every country where tillage is highly prosperous, improving manures are in use. The department of the north *(France,)* Belgium, and England owe to them in a great measure their prosperity. The department of the north (which is, of all Europe, the country where agriculture is best practised and the most productive,) spends every year upon two-thirds of its soil a million of francs in lime, marl, ashes of peat and bituminous coal, and it is principally to these agents, and not to the quality of the soil, that the superiority of its production is owing. The best of its soil makes part of the same basin, is of the same formation and same quality as a great part of Artois and Picardy, of which the products are scarcely equal to half the rate of the north. Neither is it the quantity of meadow land which causes its superiority; *that* makes the fifth part of its extent, and Lille, the best *Arrondissement*, has scarcely a twentieth of its surface in meadow: Avesne the worst of all, has one-third. Nor can any great additional value be attributed to the artificial meadows, since they are not met with except in the twenty-sixth part of the whole space. Neither can this honor be due to the suppression of naked fallows, since in this country of pattern husbandry, they yet take up one-sixth of the ploughed land, every year. Finally the Flemings have but one head of large cattle to every two hectares, a proportion exceeded in a great part of France. Their great products are due to their excellent economy in the use of manures, to the assiduous labor of the farmers, to courses of crops well arranged, but above all, we think, to the improvers of the soil, which they join to their alimentary manures. Two-thirds of their land receive these regularly: and it is to the reciprocal action of these agents of melioration that appears to be due the uninterrupted succession of fecundity, which astonishes all those who are not accustomed continually to see the products of this region."—*Puvis.*

The agriculture of adjacent parts of Belgium is even more instructive as an example. Those parts of that rich country which are now most remarkable for fertility, as for instance the *Pays de Waes*, were originally barren hills of blowing sand. They now yield a greater product than any other part of Europe. Great industry and labor have no doubt been expended in obtaining and applying putrescent manures, and in this region the clover husbandry had its rise; but with all this, no permanent fertility could have been given without the use of lime, and those substances which contain its compounds. At present a light friable mould, of greater depth than can be reached by the plough, and which is therefore occasionally trenched by the spade, covers the whole of the ancient *dunes*, and the whole country presents an aspect, of which no part of ours can even furnish an idea, with the exception of the garden grounds of the *Shakers* at Lebanon.

We fully concur with the opinion of M. Puvis in respect to the importance of earthy and saline matter, not only as forming a basis of proper character to support the plant, but as itself forming an essential part of the food. We on the other hand cannot but express our dissent from the opinion, which derives the other elements necessary to growth of plants wholly from the atmosphere. If he mean indirectly, through the intervention of the soil, he is to a certain extent right, for most of the water which is the vehicle of all their nutriment, yields at least one of their essential elements, and is itself incorporated with the plants, is derived from the atmosphere in the shape of rain and dew. But the gases it dissolves and carries with it, and which yield the carbon and part of the hydrogen of plants, are all derived from the decomposition of organic matter in the soil itself. When therefore we can find, in the absorption of water by the roots—its ascent in the form of sap—its elaboration in the leaves, where so far from an absorption from the atmosphere taking place, oxygen is evolved—in the subsequent descent of the altered sap in the form of gum, resin, &c. a sufficient reason for the supply of the parts M. Puvis seeks in the atmosphere—we are compelled to dissent from his conclusion. There is one curious fact in connexion with this subject, that we have never seen mentioned. It is obvious that while lands still retain a large quantity of vegetable matter, arising as it may, from their having been for ages in the state of forest, little benefit is to be hoped from putrescent manures, while there may be earthy substances essential to the growth of particular plants, which the soil does not contain. In such a case earthy manures are likely to be extremely serviceable.

The practical farmer in some parts of our country, finding that in a new soil, putrescent manures injure his crops, carts them out upon frozen rivers, in order that they may be carried away when the streams thaw. He thus loses all recollection of the European tradition of the necessity of restoring vegetable or animal matter to the soil, and continues a cultivation growing yearly more exhausting, until his land will no longer afford him a subsistence. His successor coming from a longer settled district, or from an European country, trusts wholly to putrescent manures, and is astonished that they often fail in their effects; but that an inert earthy matter should in some cases be a substitute for organic manure, and in others should be absolutely necessary to make it efficient, he will not believe, and laughs at the idea of cart-

ing an absolutely barren soil to an unproductive field. The earlier settler, who thinks no soil worthy of cultivation which demands any manure, would be even more astonished, were he told, that by the use of a small quantity of a substance which his experience tells him destroys vegetation, he might have easily maintained his lands in their original fertility, and instead of losing his whole labor in clearing the soil, have continued to reap crops equal to the earlier ones, whose prospect tempted him to that arduous task. Yet these propositions are strictly true.

One only mineral manure has been of any extended use in our country, namely the sulphate of lime, usually called plaster of Paris. This was luckily forced into notice by scientific farmers, and produced such obvious effects that the most skeptical could not doubt. Yet the reasons of its benefits are not generally understood, the causes of its failure in some positions not accounted for, and the injury that an unskilful use of it may produce, is rarely guarded against.

The agriculture of America has proceeded from three distinct centres, and may be divided into three distinct and separate characters. The settlers of New England were thrown upon a bleak shore, incapable of yielding any valuable agricultural product for export. They found and adopted the culture of maize as practiced by the Indians; this consisted in planting it in hills, each of which was manured by one or more fishes; and unable at first to see its value as a fallow crop, repeated it in continual succession upon the same field. To this they added the culture of European corn of various descriptions, following without alteration the husbandry introduced by the Romans into Great Britain, and which is described almost indentically in the Georgics of Virgil. With a less command of labor, however, the fallow were less perfect than in England, and presented rather the aspect of plantations of weeds, than of the naked pulverized soil which ought to characterize them. Wheat was first attempted, but gradually abandoned as unprofitable; rye followed, and is still cultivated, while a great improvement has taken place in making it, or oats, follow corn, and thus introducing the rotation of crops. The failure of wheat was in New England ascribed to any thing but the true cause; and it has been usual to lay the blame to the presence of the barberry bush. This indeed infests the fields from which wheat is banished, but is no more than the natural growth of a soil from which the earthy matter necessary to the nutriment of wheat is exhausted. This eastern mode of farming has derived great improvement from the introduction of sown meadows instead of naked fallows, and the climate admits of grazing them with benefit to the soil rather than injury. At a distance from the sea, clover has been introduced for this purpose, and has by the aid of plaster extended its beneficial influence along the southern shore of the great lakes, almost to the Mississippi.

It is to this lucky accident, as it may in fact be termed, that it is owing that the more newly opened regions in the northern states have not depreciated as much as those which were cultivated more early. Still, the habits of the pioneers of civilization, of eastern origin, are such as to make sad havoc with the native bounty of the earth.

The settlers of Virginia, on the other hand, found in their soil and climate the capacity of yielding tobacco, which formed an article of such value, as to dispense with their raising any other, for by its sale they could provide themselves even with bread stuffs. Not only did it do away with this as a necessity, but it furnished them with the means of purchasing slave labor, by which they were enabled to increase the extent of ground brought into cultivation, in a ratio far greater than was at first attempted in the eastern states. While in the latter regions, the settlers were at first collected in villages and hamlets, around which their arable lands were opened at the least possible distances, and every consideration of interest led the inhabitants to attempt to keep them in tolerable condition, the settlers of Virginia, after the first struggle with the natives was over, spread themselves in separate plantations at great distances from each other. Each planter took into possession an extensive district of wood-land, of which he cleared as much as his slaves were able to cultivate. So soon as by a continual succession of hard cropping with the same article, the power of raising tobacco was exhausted, new woodland was cleared and brought into cultivation; and thus in the older regions there has been no single acre of land of tolerable promise, that has not at some period or other been subjected to the plough. The virgin soil having been thus completely explored, it remained to abandon the country altogether, or bring it back to cultivation by enriching manures, and in the manner of applying, the proposed remedy became almost as fatal as the disease itself. The putrescent manures furnished by the whole stock of a plantation were lavished upon a few acres, and applied to the continual cultivation of the favorite staple, until they were again exhausted; and thus in succession, until a second round of ruinous cropping had been completed.

As the staple fell in value, from the increased population employed in its culture, Indian corn and wheat became objects of attention; but they were merely secondary, and did not enter into rotation with tobacco. Were we to hazard an opinion founded upon analogy, we should feel almost certain that tobacco well manured would form a substitute for a fallow crop, and might, in a well planned rotation, impair in no degree the native fertility of a soil. We have ascertained, in fact, that it is an admirable preparation for wheat; but the temptation to continue the tobacco culture is such, that it is rarely intermitted until the land becomes a *caput mortuum*.

The same system has been pursued in all the southern states, which may in this respect be considered as colonies of Virginia, and in all have the same consequences inevitably followed; immense products at first, in consequence of the intrinsic value of the peculiar staple, whether cotton or tobacco; improvident expenditures, arising from the difficulty of distinguishing what part of the annual income was in fact an encroachment upon the capital; and finally, impoverishment or ruin. To the latter event the large families of slaves, which the apparent profits of the earlier culture induced the planters to acquire, contribute in no small degree, as well as their disproportionate increase in a state of being free from all care and anxiety. This state of things is well described by Mr. Ruffin, in one of his notes.

"A gang of slaves on a farm, will often increase to four times their original number in thirty or forty years. If a farmer is only able to feed and maintain his slaves, their increase in value may double the whole of his capital originally vested in farming, before he closes the term of an ordinary life. But few farms are able to support this increasing expense, and also furnish the necessary supplies to the family of the owner —whence, very many owners of large estates in lands and negroes, are throughout their lives too poor to enjoy the comforts of life, or to incur the expenses necessary to improve their unprofitable farming. A man so situated may be said to be a slave to his own slaves. If the owner is industrious and frugal, he may be able to support the increasing number of his slaves, and to bequeath them undiminished to his children. But the income of few persons increases as fast as their slaves, and if not, the consequence must be, that some of them will be sold that the others may be supported; and the sale of more is perhaps afterwards compelled, to pay debts incurred in striving to put off that dreaded alternative. The slave at first almost starves his master, and at last is eaten by him—at least, he is exchanged for his value in food."

The waste of productive capital due to the use of slave labor, does not appear in this statement. By the estimate of Mr. Ruffin himself, the annual *wages* incurred by the employment of a slave amount to $38; the whole of the expenses to $86 50. By the account of one of his southern correspondents, in the Farmers' Register, an agricultural hired laborer in the state of Rhode Island does the work of 2½ slaves, and his wages and food we presume will not cost his employer more than $173. The northern farmer, therefore, saves one fifth; but it is, in addition, to be recollected, that the southern planter must support the children, the aged, and females who can do no work. We therefore think we are safely warranted in saying, that every piece of agricultural labor performed by a slave in a southern state, costs one-half more than if performed in an eastern state by a freeman. The difference, indeed, would not be perceptible, if they labored side by side, for the freed negro or white hireling would disdain to work in such a case; but as the comparative result between different portions of our country, it is unquestionable. The effect upon the general prosperity is, however, far greater than would appear from the comparison, for every laborer in the eastern states saves a part of his wages, to add to the national wealth; the children, the women, find profitable occupations, and thus a barren county of New England, in which there may not be a single wealthy individual, may notwithstanding possess a far greater collective wealth than an equal surface of the richest cotton region in the southern states.

The settlers of Pennsylvania commenced the cultivation of that state under different circumstances, and with different views from those either of the east or of Virginia. Penn's plan made cities or boroughs, the seats of traffic and markets of produce, the *nuclei* of his agricultural settlements, and by a mutual dependence thus created, fixed the agriculturist in the neighborhood of the merchant and manufacturer. The very state of things which a slow course of events has brought about in New England, was contemplated by that enlightened proprietor from the first. The dairy and the beeve were therefore the staples, and other products became the accessories; thus it has happened, that the farmers of the neighborhood of Philadelphia, are the only settlers of English blood, who have resisted the migratory habits of other parts of the country. In that neighborhood, the original fertility has been kept up by the manure yielded by the stocks of cattle which formed the basis of the system, and that which is afforded by the stables and streets of the city. A similar dread of change influenced the Germans, who followed the Quakers, in the occupation of the more remote districts of Pennsylvania; and while bread stuffs naturally became the only profitable objects of culture, they avoided the exhaustion which their growth produced in other districts, by a most valuable secret they brought with them from Europe. We call it a secret, for those of other blood, who see it used in their presence, do not discover its value. This is neither more nor less than the use of lime. By this simple but efficient aid, the farms of Pennsylvania have generally maintained their original character for fertility, and in some places have increased in products, beyond the early crops that are given by the proverbial energy of a virgin soil. To show how slowly an agricultural process, however valuable, passes from one race of settlers to another, we may mention what we ourselves saw, during the last summer, in Hunterdon county, New Jersey. The southern part of this county is settled by Germans, who have entered from Pennsylvania; the northern, by those of various races who have mounted the valley of the Raritan. The soil, in many places, is to appearance identical, being formed by the decomposition of the red shale; the Germans, by the use of lime, raise from thirty to forty bushels of wheat per acre, and their other products are in proportion; the settlers of Yankee and Dutch blood, are happy to get from fifteen to twenty. We hope, for the sake of our argument, that the same German race has carried the same practice along with it, in its progress through the valley of Virginia to North Carolina; for in the last named state we noticed a contrast even stronger than the one we have stated. After travelling for many miles through wastes of old fields, we entered the German settlement of Salem, which, without any perceptible change in the original character of the soil, presented the rich appearance of Pennsylvania.

In the foregoing statement, we have not included the settlers of the Dutch province of the New Netherlands, not because they brought with them little agricultural skill, but because their example has been of little influence upon the present agriculture of the United States. It is, however, but justice to them to mention, that many of them being Protestants, expelled from the southern Netherlands by the persecutions of the Spanish crown, the modes, implements, and practice of husbandry which they introduced, were the very best which then existed, and that although part of these were necessarily abandoned under the new circumstances in which they were placed, their implements in particular were superior, if applied to light soils, such as those of their native Brabant, to any brought to America by other races. Long Island, to which these were well fitted, bore, in consequence, previous to the Revolution, the well merited epithet of the garden of the colonies. But the Flemish, Walloon, and Frisian blood was not excited by the same inventive spirit

as the Anglo-Norman; and unable to accommodate themselves to new circumstances, the Dutch settlers of rocky and rugged districts fell behind the New England yeomanry in agricultural skill.

We have called the use of lime a secret: it was not only so to the practical farmer, but to the man of science; for even the researches of Davy, who was well aware of its importance, have not completed the theory of its action. It is, therefore, with no small pride, that we can refer to a countryman of our own, as having finished what the most acute researches of European chemists had left unaccomplished. This credit is due to Mr. Ruffin, and with him as a guide, and with some little aid from the article of which he is the translator, we shall endeavor to exhibit, in a succinct form, the theory of calcareous manures.

In order to make this complete, we shall be compelled to state facts, which to the majority of the readers of this journal will appear trite and hacknied. As our main object, however, is to call to this subject the attentinn of intelligent farmers, who may not recollect familiarly the elements of science, our more learned readers must pardon us, if we devote a few lines to matters in which they need no instruction.

Pure lime is so rarely found in nature, that it may be stated as a general rule, that it can be obtained only artificially, in the process of calcination, as practiced in preparing limestones for making mortar. Thus obtained, lime retains the original figure of the stone from which it is manufactured, is acrid and caustic, soluble in small proportion in water, and possesses alkaline properties, that is to say, it is capable of neutralizing acids, and forming with them substances of the class to which chemists give the name of salts. Of these salts, those most important to the agriculturist are, the carbonate, which forms the principal part of common limestones, chalk, and the shells of testaceous fish; sulphate of lime, which in combination with water constitutes gypsum or plaster of Paris; and phosphate of lime, which is the basis of the bones of animals, and has been found in the ashes of plants.

When exposed to air, lime attracts carbonic acid, and passes back to the state whence it was reduced by fire, but loses its figure and falls slowly to powder. When water is thrown on lime, it undergoes the process called slaking, and falls rapidly to powder, producing a hydrate, which is a combination with water. This powder, when exposed to the air, also rapidly passes into carbonate of lime. Both lime and its combination with water promote the decomposition of animal and vegetable substances, and absorb the gases which are generated by their putrefaction. The latter property is also possessed by the carbonate of lime, when in a state of fine powder, or even when it merely exposes a large surface to their action, and although rarely mentioned by chemists, and in itself purely mechanical, is of the most familiar character, being habitually called into use in our domestic economy, to correct offensive effluvia, and absorb the miasmata which produce disease.

The two other earths, as usually found in soils, (silica the base of flint and sand, and alumina, the base of clay,) appear to possess this mechanical property, either not at all or in a very inferior degree.

Lime, when mixed with these earths, gives them this property, and at the same time modifies their characters in a most remarkable manner. Silica, which has no attraction for moisture, is rendered retentive of water by lime; and clay, which forms, with abundance of water, a plastic paste, and hardens, on partial drying, into a tough clod, loses its plasticity and is rendered friable.

Lime in the form of carbonate, still possesses these mechanical properties, and thus limestone, or shells even coarsely powdered, will absorb the gases of putrescent bodies, render sand more retentive of moisture, and convert a stiff clay into a friable loam.

The alteration of the mechanical character of soils, is the first and most obvious effect produced by lime. For this purpose, it may be applied either caustic, as prepared by burning, merely pulverized from chalk or limestone, or in the form of disintegrated shells. The caustic form is more rapid, but not more sure in its action; and the burning of limestone, when this is the object, is no more than a cheaper mode of reducing it to powder, through the intervention of slaking.

When the soil contains inert vegetable matter, which has ceased to undergo fermentation, caustic lime will promote the putrefactive process, and prepare it for the food of plants. If the process of fermentation has stopped after the acetic stage, and left the soil acid, either caustic or carbonated lime will neutralize the acid; it will not only thus prepare the soil to bear plants, which would not otherwise grow, but, by removing the antiseptic action of the acid, permit other vegetable matter to undergo putrescense, and thus supply an appropriate food for plants.

The principal part of the food of all plants is derived from the gases and soluble matters furnished by the decomposition of organic bodies. These gases tend to expand and distribute themselves through the atmosphere, with the exception of such as are soluble in the moisture of the soil, or such as the earth may retain by mechanical attraction. Lime and its compounds have by far the greatest powers in the last respect, and thus, if a soil is calcareous, it will retain these elements of fertility, and give them out only as they are required by the wants of the vegetables that grow upon it; it will be but little injured by exposure to the air when uncovered, and will retain its fertility longer. It will receive a greater quantity of animal and vegetable manure without poisoning the plants by excess of nutriment, and the effects of a given quantity will be longer sensible. If the soil contain no carbonate of lime, this property may be given artificially by manuring with slaked lime, which rapidly becomes carbonated; with powdered limestone or chalk; with marl in the proper sense of the term; or with recent or fossil shells.

Here it might at first be imagined, that the more free a soil is from calcareous matter, the greater the quantity of carbonate of lime which might be applied; but this is exactly the reverse of what is pointed out by experience. We do not consider that this fact is difficult of explanation. Lime cannot alter the mechanical texture of soils, nor give to the whole mass, the property of absorbing gases, except by entering into chemical combination with their other constituents. Such changes of character are not only the universal consequence of che-

mical action, but the strongest proofs of its having taken place. The case before us, is therefore, no more than one of a large class in chemistry, where it is necessary to apply a chemical agent much diluted at first, while, after the action has once commenced, the strength of the agent may be gradually increased with advantage; and in the same way, upon poor and exhausted soils, a large dose of calcareous matter may produce no benefit, or even positive injury, while a lighter dressing may produce immediate good effects, and prepare the soil to receive with advantage, larger quantities. The addition of putrescent manures, enables the lands to receive a larger dose of lime even from the first, and the successive dressings may in like manner be increased if green crops are ploughed in, or stable manure added. This is also consistent with theory, for the surplus lime may be advantageously employed in absorbing the gases generated by the decomposition. Still these are facts that, although we may explain them in conformity with chemical principles, could not readily have been predicted before hand.

One curious fact was observed by Mr. Ruffin, in his chemical analyses of the soils of Virginia, namely, that even in regions where the rock, by whose decomposition the soil was formed, was limestone, not only did no carbonate of lime manifest itself by effervescence with acids, but no precipitate was formed by the tests of lime in the acid solution. He could not admit that, in such soils, lime was absolutely wanting, and therefore inferred, that it was in such a state of combination, as to be neither soluble in water, or decomposable by nitric acid. Such a combination is the oxalate of lime, but as he has made no direct inquiry into its presence, and some of his correspondents have questioned the probability of such an union existing, he has, with the true spirit of an inductive inquirer, modified his assertion until farther proof be obtained. We, however, do not think that so much modesty was necessary, for it can be shown that the formation of oxalic acid, and its consequent combination by superior affinity with lime, whatever may be its previous state of combination, are at least probable, if not certain.

The formation of nitric acid in calcareous soils, by the absorption of its two elements from the atmosphere, is not only rendered probable by the presence of nitre and nitrate of lime in the soils of many warm countries, but made certain by the construction of artificial nitre beds in France, when the foreign supply was cut off by the preponderance of the British navy. When this acid is formed in a soil abounding with vegetable matter, not yet decomposed, as is the case with many of our newly opened regions, oxalic acid *must* be formed.

Such then are the properties of lime, considered as a constituent of the soil: to bring its texture to that best suited for tillage, and for conveying the moisture, which is the vehicle of the food of plants, neither in excess or in defect; to condense and store up that gaseous food until needed; to promote the decomposition of inert organic matter; to neutralize acidity, and counteract its antiseptic action, thus removing a noxious principle, and opening a new supply of vegetable food.

One other use of lime in soils remains to be mentioned, and this does not seem to have occurred to Mr. Ruffin, but is strongly urged by M. Puvis, in a passage we have quoted. The ashse of all plants, when lixiviated, are composed eithre of the pure earths or earthy salts; of the latter, those of lime are by far the greatest in quantity, although probably altered by the fire from their original state. Thus, wood ashes contain the carbonate, sulphate, and phosphate of lime. In addition, the liquor by which the alkaline matter is separated by lixiviation carries with it earthy matter, which is rendered soluble by the alkali. Now it cannot be doubted, that if this alkaline, earthy and saline matter is not contained in the soil, the plant must be stinted in its growth or actually die. Thus to many plants, lime, or some of its compounds, forms an essential article of food; it may be required in less quantity than carbon, hydrogen, oxygen, and water, but is not the less necessary to their growth. Now, former analyses did not show that lime and its compounds are contained in the stalks and seeds of the cereal gramina; but the existence of earthy matter, undissolved by water or alcohol, or left as a rediduum of combustion, was well known. More recent investigations have shown, that lime is one of the constituents of this residuum. Silex certainly exists in the stalks, and particularly at the joints of the gramina, being in some actually visible to the naked eye.

It is upon the same principle only, namely, that it serves as the food of plants, that we can account for the effects of gypsum upon certain crops, which, in any other mode of viewing them, would appear miraculous. This sulphate of lime, if merely ground, has no attraction for moisture, and, if burnt, would rather absorb it from the soil than the air; it cannot therefore act, as some have supposed, to increase the deposite of dew; it is so sparingly soluble in water, and so inert, that it cannot act as a stimulus, nor is it certainly followed by exhaustion, as all stimuli must be. But although sparingly soluble, it is still conveyed by water, into the bodies of plants, although in small quantities, and as that water undergoes the chemical changes, which we know are induced by the vital action of plants, the sulphate of lime must be deposited in them, injuriously perhaps to some, but as a necessary food to others. Thus, it has been found that the ashes of clover, lucern, and many of those plants whose growth is known to be most certainly promoted by gypsum, uniformly contain sulphate of lime; it is, therefore, their essential and appropriate food. Some soils may contain it naturally—here an addition will not increase the crop of such plants; some may contain a substance which will decompose the sulphate, and thus prevent its action. The earth baryta will separate the sulphuric acid from lime, and thus may produce this effect; but this is so rare, that injury from this cause can hardly be anticipated. Oxalic acid will separate the lime from the sulphuric acid, and thus will not only render the application of gypsum inefficient, but will also set the acid free to act injuriously. But if the oxalic acid has been previously neutralized by lime, the sulphate remains unaltered, and is capable of aiding the growth of clover and other plants of the sort. In confirmation of this view of the subject, we may quote the experience of Mr. Ruffin. His soil would not produce clover, even with the aid of plaster; and this being known, he did not attempt to use it, un-

til encouraged by a spontaneous and luxuriant growth of white clover. We may also state a fact, within our own knowledge. It is a general belief, that in the neighborhood of the sea, plaster is useless, and it has been so found in general on the Island of New York and in the adjacent county of Westchester; yet upon a narrow ridge of magnesian marble, which lies between the layers of gneiss and mica slate which form the greater part of this region, we have seen plaster used with great success.* Yet clover, when aided by putrescent manures, is a successful crop, on the gneiss, without the artificial aid of plaster; both this is readily accounted for, as sulphuret of iron is not rare, which being decomposed, and thus yielding sulphuric acid to combine with the lime of the feldspar, supplies the necessary food of the plant. In England, too, where a saline air, prevailing almost universally, is generally supposed to forbid the use of gypsum, there are calcareous soils on which it is beneficial, as in Kent, which is as much exposed to the blast of the sea as almost any part of the kingdom. Among the many advantages of calcareous manures, then, may be mentioned, as not the least, that it will prepare the way for the introduction of the clover husbandry, in regions where it would otherwise be impracticable.

Mr. Ruffin's own experience is limited to the regions of Virginia within reach of the tide, and to these his remarks are, with a just philosophical spirit, restricted; yet his extensive experience and accurate observation furnish the ground for a theory which must be useful, if properly understood and applied, in any district whatsoever.

The soils of this region were, on examination, found to be wholly destitute of calcareous earth, except a few isolated spots enclosed within them, which were observed to manifest, even to the eye, fragments of shells, and yielded lime on analysis. These spots were proverbial for their fertility, and remarkable for the fact, that on some of them a long continued succession of the same crop had been annually cultivated, without, absolute exhaustion. On a careful examination, Mr. Ruffin found that these shells, supposed to be the relics of Indian encampments, were the outcrop of fossil layers, and he succeeded in tracing these layers to his own land.

"My use of calcareous earth, as a manure, has been almost entirely confined to that form of it which is so abundant in the neighborhood of our tide waters, the beds of fossil shells, together with the earth with which they are found mixed. The shells are in various states—in some beds generally whole, and in others reduced nearly to a coarse powder. The earth which fills their vacancies, and makes the whole a compact mass, in most cases is principally silicious sand, and contains no putrescent, or valuable matter, other than the calcareous. The same effects might be expected from calcareous earth in any other form, whether chalk, limestone, gravel, wood ashes, or lime, although the two last have other qualities besides the calcareous."

"During the short time that lime can remain quick, or caustic, after being applied as manure, it exerts (as before stated) a solvent power, sometimes beneficial, and at others hurtful, which has no connexion with its subsequent and permament action as calcareous earth."

"These natural deposits of fossil shells are commonly, but very improperly, call marl. These misapplied term is particularly objectionable, because it induces erroneous views of this manure; other earthy manures have long been used in England, under the name of marl, and numerous publications have described their general effects and recommended their use. When the same name is here given to a different manure, many persons will consider both operations as similar, and perhaps may refer to English authorities for the purpose of testing the truth of my opinions, and the results of my practice. But no two operations, called by the same name, can well differ more. The process which it is my object to recommend, is simply the application of calcareous earth, in any form whatever, to soils wanting that ingredient, and generally quite destitute of it; and the propriety of the application depends entirely on our knowing that the manure contains calcareous earth, and what proportion, and that the soil contains none." (p. 34.)

This being his object, he enforces the use of calcareous manures, both by example and a well grounded theory.

The comparative effects of the marl in various proportions, of stable and cow-pen manure, and of marl mixed with manure, were fairly tried, and tested with the product of land without addition. We have not time to enter into the detail of the operations, and of the several products. It is sufficient to say, that by the mixture of marl and and manure, the crop of corn was raised from twelve to thirty-six bushels per acre; by eight hundred bushels of marl, from twelve to an everage of twenty-three; by four hundred and fifty bushels of marl, from twelve to somewhat less than twenty seven; that the mixture and the last named dressing of marl alone, showed a subsequent increase when corn returned in a four years' rotation, while the others showed an average decrease; that the wheat crops were increased in about the same ratio; but that clover, which before had not grown at all, became a good crop on the marled patches. This was upon soil which had before been in cultivation. Similar results followed upon land newly reclaimed from the forest. The next important inference to which we shall refer, is the advantage derived from the use of gypsum, upon soils which have been dressed with marl. This inference was reached, by observing the effect of a layer of the fossil shells, which contained sulphate of lime.

On one point only are we compelled to dissent from Mr. Ruffin. He states it broadly as his belief, that a soil may be either so constituted naturally, or so improved by the artificial application of carbonate of lime, that it shall never thereafter need a farther supply. There will no doubt be a limit reached in both ways when an addition of lime will be injurious, but as this substance is in fact a necessary part of the nutriment of many plants, their growth will slowly remove it, and the time may at last come when a new supply will be necessary, to restore or retain the original natural fertility. But soils, thus prepared by nature or improved by art, may retain for long periods of time their power of giving value to the original vegetable matter in the soil, or the putrescent manures applied, either in the form of green crops or of stable manure, and the English saying, that no man need marl his field a second time, is founded on sound observation. Soils of such a character, either native or artificial, are to the husband-

*It has been used, with entire success, on lands washed by the sea, at Stamford, in Connecticut, by the late Mr. Moses Rogers.—*Ed. Journal of Science.*

man, what labor saving machines are to the mechanic; they are in fact engines by which the greatest possible return may be obtained by the least expenditure of labor. No part of the seaboard of the United States, with the exception of small and isolated districts, present soils of this character. It is only after passing the first range of mountains that a limestone formation is met with. This, is or was, proverbial for its fertility, of which the Fishkill, Swetara, and Shenandoah valleys,are well known instances. The same formation can be traced to the valley of the Schoharie, in New York, and it is recorded by tradition to have had even a higher character than any of the others; its glory has however, departed, and the Genesee, which is a similar formation, now holds the rank in public estimation, the Schoharie once possessed. Both the valley of the Schoharie, and the vicinity of Lancaster, Pa., were occupied by German settlers; the former Palatines, the latter of more northern birth. The former were ignorant of the use of lime, the latter brought it with them, and being fortunately no chemists, saw no impropriety in applying it in small quantities, and at intervals, to a soil originally calcareous. The difference of the results, is an interesting illustration of the value of this manure. In the valley of the Schoharie, land tilled with equal industry and economy, will not command a fourth of the price of that of the vicinity of Lancaster.

The experiments of Mr. Ruffin, were made, as we have stated, upon the soils of lower Virginia. He introduces his description of them in the following striking manner.

' "During several days of our journey, no spot was seen that was not covered with luxuriant growth of large and beautiful forest trees, except where they had been destroyed by the natives for the purpose of cultivation. The least fertile of their pasture lands, without seeding, are soon covered with grass, several feet in height; and unless prevented by cultivation, a second growth of trees rapidly spring up, which, without care or attention, attain their giant size in half the time that would be expected in the best soils in England." '

"If the foregoing description was met with in a "Journey through Hindostan," or some equally unknown region, no European reader would doubt that such soils were fertile in the highest degree—and even many of ourselves would receive the same impression. Yet it is no exaggerated account of the poorest natural soils in our own poor country, which are as remarkable for producing luxuriant growths of pines and broom-grass, as for their unproductiveness in every cultivated or valuable crop. We are so accustomed to these facts that we scarcely think of their singularity; nor of the impropriety of calling any lands barren, which will produce a rapid growth of any one plant. Indeed, by the rapidity of that growth, (or the fitness of the soil for its production,) we have in some measure formed a standard of the poverty of the soil.

"With some exceptions to every general character, the tide-water district of Virginia, may be described as generally level, sandy, poor, and free from any fixed rock, or any other than stones rounded apparently by the attrition of water. On much the greater part of the lands, no stone of any kind is to be found of any larger size than gravel. Pines of different kinds, form the greater part of a heavy cover to the siliceous soils in their virgin state, and mix considerably with oaks and other growth of clay land. Both these kinds of soils after being exhausted of their little fertility, by cultivation, and "turned out" to recruit, are soon covered by young pines, which grow with vigor and luxuriance. This general description, applies more particularly to the *ridges*, which separate the *slopes* on different streams. The ridge lands are always level, and very poor; sometimes clayey—more generally sandy, but stiffer than would be inferred from the proportion of silicious earth they contain, which is caused by the fineness of its particles. Whortleberry bushes as well as pines, are abundant on ridge lands, and numerous shallow basins are found, which are ponds of rain water in winter, and dry in summer. None of this large proportion of our lands, has paid the expense of clearing and cultivation, and much the greater part still remains under its native growth. Enough however has been cleared and cultivated in every neighborhood to prove its utter worthlessness, under common management. The soils of ridge lands vary between sandy loam and clayey loam. It is difficult to estimate their general product, under cultivation; but judging from my own experience of such soils, the product may be from five bushels of corn, or as much wheat, to the acre, on the most clayey soils, to twelve bushels of corn and three of wheat on the most sandy—if wheat were there attempted to be made.

"The *slopes* extend from the ridges to the streams, or to the alluvial bottoms, and include the whole interval between neighboring branches of the same stream. This class of soils, forms another great body of lands of a higher grade of fertility, although still far from valuable. It is generally, more sandy than the poorer ridge land, and when long cultivated, is more or less deprived of its soil, by the washing of rains on every slight declivity. The washing away of three or four inches in depth, exposes a steril subsoil (or forms a "gall,") which continues thenceforth bare of all vegetation; a greater declivity of the surface serves to form gulleys several feet in depth, the earth carried from which, covers and injures the adjacent lower land. Most of this kind of land has been cleared and greatly exhausted. Its virgin growth, is often more of oak, hickory and dog wood, than pine; but when turned out of cultivation, an unmixed growth of pine follows. Land of this kind in general, has very little durability; its usual best product of corn, may be for a few crops, eighteen or twenty bushels, and even as much as twenty-five bushels, from the highest grade. Wheat is seldom a productive or profitable crop on the slopes, the soil being generally too sandy. When such soils as these, are called rich or valuable, (as most persons would describe them,) those terms must be considered as only comparative; and such an application of them proves that truly fertile and valuable soils are very scarce in Lower Virginia.

"The only rich and durable soils, below the falls of our river, are narrow strips of highlands along their banks, and the lowlands formed by the alluvion of the numerous smaller streams, which water our country. These alluvial bottoms, although highly productive, are lessened in value by being generally too sandy, and by the damage they suffer from being often inundated by floods of rain. The best highland soils, seldom extend more than half a mile from the river's edge, sometimes not fifty yards. These irregular margins are composed of loams of various qualities, but all highly valuable, and the best soils are scarcely to be surpassed, in their original fertility, and durability under severe tillage." (pp. 11, 12.)

"The simple statement of the general course of tillage, to which our part of the country has been subjected, is sufficient to prove that great impoverishment of the soil, has been the inevitable consequence. The small portion of rich river margins, was soon all cleared, and was tilled without cessation for many years. The clearing of the slopes was next commenced, and is not yet entirely completed. On these soils the succession of crops was less rapid, or from necessity, tillage was sooner suspended. If not rich enough for tobacco when first cleared, (or as soon as it ceased to be so,) land of this kind was planted in corn, two or three

years in succession, and afterwards every second year. The intermediate year between the crops of corn, the field was "rested" under a crop of wheat, if it would produce four or five bushels to the acre. If the sandiness, or exhausted condition of the soil, denied even this small product of wheat, that crop was probably not attempted; and instead of it,the field was exposed to close grazing, from the time of gathering one crop of corn, to that of preparing to plant another. No manure was applied, except on the tobacco lots; and this rotation of a grain crop every year, and afterwards every second year was kept up as long as the field would produce five bushels of corn to the acre. When reduced below that product, and to less than the necessary expense of cultivation, the land was turned out to recover under a new growth of pines. After twenty or thirty years, according to the convenience of the owner, the same land would be again cleared and put under similar scourging tillage, which would then much sooner end as before, in exhaustion. Such a general system is not yet every where abandoned, and many years have not passed since such was the usual course on every farm. How much our country has been impoverished during the last fifty years, cannot be determined by any satisfactory testimony. But, however, we may differ on this head, there are few who will not concur in the opinion, that our system of cultivation has been every year lessening the productive power of our lands in general, and that no one country, no neighborhood, and but few particular farms have been at all enriched, since their first settlement and cultivation. Yet many of our farming operations have been much improved within the last fifteen or twenty years. Driven by necessity, proprietors direct more personal attention to their farms—better implements of husbandry are used, every process is more perfectly performed—and, whether well or ill directed, a spirit of inquiry and enterprise has been awakened, which before had no existence. Throughout the country below the falls, and perhaps thirty miles above, if the best land be excluded, say, one-tenth, the remaining nine-tenths, will not yield an average product of ten bushels of corn to the acre; although that grain is best suited to our soils in general, and far exceeds in quantity, all other kinds raised. Of course the product of a large proportion of the land would fall below this average."

"Such crops cannot in many cases remunerate the cultivator. If our remaining woodland should be at once brought into cultivation, the gross product of the country would be greatly increased, but the net product, very probably diminished—as the general poverty of these lands would cause more expense than profit, to accompany their cultivation under the usual system. Yet every year we are using all our exertions to clear woodland, and in fact, seldom increase either gross or net product—because nearly as much old exhausted land is turned out of cultivation, as is substituted by the newly cleared. Sound calculations of profit and loss would induce us to reduce the extent of our present cultivation, by turning out every acre that yields less than the total cost of its tillage." (p. 12.)

The green sand formations which yield the marl of Mr. Ruffin, are to be found also in Maryland and in Jersey. In the latter state, its use was commenced as early as 1805, by the Rev. John Singleton of Talbot county, and has been continued to the present time with great success. His example has been followed by his neighbors in the same county, and the practice has extended into Queen Ann's; but it does not appear that it has yet been introduced on the western shore of the Chesapeake. In Jersey, the county of Monmouth, at one time considered almost irretrievably barren, has been raised to great productiveness by the use of this manure.

This formation, or one analogous in its fertilizing character, is however of no frequent occurrence; it therefore remains for us to inquire whether other forms of calcareous matter may not answer the same purpose. Such is the extensive diffusion of lime in nature, that there are few or no regions where it cannot be procured. Even in primitive regions, beds or veins of granular carbonate of lime, are of occasional occurrence, and in those which are alluvial, the remains of recent shell fish are not wholly wanting. Much, however, will depend, in the success of its application, upon the quantity which is required, as it may happen that when this is considerable, the expense of transportation may equal, or more than counterbalance the benefit it is calculated to produce. This question can be solved only by reference to the practice of those countries, in which lime has been applied with success.

In the north of England, and in Scotland, the use of lime as a manure may almost appear to be excessive. Two hundred bushels per acre are often applied to sandy soils, and from three to four hundred on clay. Dressings of this amount are renewed once in every term of twenty one years. This high rate of application could not however be practised upon land not yet habituated to its use, and would in most parts of the United States, be too costly to yield any profit.

In England the lime is usually laid in small heaps on the fields, in its caustic state, and spread as soon as it becomes air-slaked.

In the department of l'Ain in France, the dressings are about eighty bushels to the acre, and are applied as a preparation for every grain crop.

The lime here, is also laid in heaps in its caustic state, but these are immediately covered with earth, which remains until the lime is slaked, when the earth and it are intimately mixed, and after having rested for a fortnight, are again thoroughly incorporated. In this state they remain for another fortnight, when the whole is uniformly distributed over the ground.

In Flanders the quantity of lime applied, is from forty to fifty bushels to the acre, and the dressing is not repeated oftener than once in ten or twelve years. The lime is usually mixed with the ashes of bituminous coal, or of turf, or formed into a compost with other manures.

In the department of La Sarthe, the lime is applied once in three years, and in the form of compost.

" For that, there is first made a bed of earth, mould or turf, of a foot, or thereabout, in thickness. The clods are chopped down and then a layer of unslaked lime is spread over them, at the rate of a hectolitre for twenty cubic feet, or a ton to forty five cubic feet of earth.* Upon this a second layer of earth, of the same thickness as the first, is placed; on this is laid a second layer of lime; and the whole covered by a layer of earth. If the earth is moist, and, the lime recently burnt, eight or ten days will suffice to slake it completely. Then the heap is cut down and well mixed—and this operation is repeated afterwards before using the manure, which is delayed as long as possible, because the power of the effect on the soil is increased with the age of the compost, and especially if it has been made with earth containing much vegetable mould."—*Puvis.*

* These two quantities do not correspond, but as we have not the original to refer to, we are compelled to take the translation as we find it.

The quantity used in La Sarthe is not more than twelve bushels to the acre, and is laid upon the land in alternate rows, with barn yard manure. In the opinion of M. Puvis, this method, although the least expensive, is the best, and it may be said to be within the reach of almost every American agriculturist.

The advantage of the use of lime may be stated in a few words; it is an essential part of the seed of wheat, and that valuable grain will not grow in any soil which does not contain it. It may, therefore, be reasonably hoped that the culture of this plant may, by the aid of lime, in this comparatively cheap mode, be restored in those districts whence it has long been banished.

In the United States the use of lime is limited to the districts into which the descendants of the Germans, who settled in Pennsylvania, have introduced the method they brought from their native country. It is usual to apply from thirty to forty bushels per acre, and in some instances one hundred bushels have been used to advantage. The limestone, by the analysis of Dr. Cooper, yielded in some instances as much as 16 per cent. of magnesia. It therefore comes into the class of magnesian limestones, the employment of which requires caution, for this earth absorbs carbonic acid from the atmosphere much more slowly than lime, and so long as it is uncombined may be injurious to plants.

The high price of grain in Great Britain, during the long wars of the French Revolution, acted as a stimulus upon the use of inferior soils, and these were rendered arable by the use of lime; but the improvement thus produced has been permanent, and although a fall in the price of agricultural products may have lowered rents, or ruined those who had contracted to pay high ones, we have heard of no instance of its becoming expedient to abandon the soils once brought into tillage by the aid of lime. The most remarkable fact of all is, that many of the newly reclaimed lands, in districts formerly considered as sterile both by nature and climate, were raised to a higher value than those of ancient fame for fertile soil and favorable skies. Thus, twenty years since, the rents of Northumberland, Berwick and Dumfries, were higher, per acre of arable soil, than those of Gloucestershire, and we were witnesses of the migration of tenants, from the northern to the southern region, at the request of landlords, who wished to introduce the Scottish husbandry, of which lime is the main support, into the fertile vales of the Severn.

We cannot conclude, without recommending the perusal of the works whose titles stand at the head of this article, to the attention of every American landholder. A skilful application of the principles they illustrate, would go far to check the annual decrease in fertility, which takes place in many of our districts; a decrease which has already made some of the regions once most productive in bread stuffs, importers of that necessary element of existence, and which subjects us most deservedly to the reproach of being unable to retain the blessings which Providence has showered with a lavish hand upon our country.

One other important consideration requires notice, and this is the change in healthfulness which the application of calcareous earth to soils abounding in vegetable matter, is likely to produce. Mr. Ruffin cites facts in which he is corroborated by M. Puvis, which would almost warrant the conclusion, that this will be an efficient remedy for the malaria, whose influence is extending itself over every part of our middle and southern seaboard. There are indeed causes, such as stagnant waters, mill ponds, and rice cultivation, which are beyond its reach; but there are other cases, where if there be any reliance on the usual theory of the causes, calcareous manures ought to be efficient in checking an infliction, which drives the white population, during the summer and autumnal months, from many of the fairest portions of the United States, and in others materially shortens the average duration of human existence.

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From Loudon's (English) Gardener's Magazine.

*An Essay on Calcareous Manures.* By EDMUND RUFFIN. Small 8vo, pp. 242. Petersburg, Lower Virginia, 1832.

The object of this Essay, Mr. Ruffin informs us, is to investigate the peculiar features and qualities of the soils of the tide-water districts of Lower Virginia; "to show the causes of their general unproductiveness; and to point out means, as yet but little used, for their effectual and profitable improvement." The sterility of these soils Mr. Ruffin has ascertained to arise from their being destitute of calcareous earth, and from their being injured by the presence of vegetable acid.

After two chapters on earths and soils generally, and on the soils and state of agriculture in the tide-water districts of Virginia, the author treats of the different capacities of soils for improvement, and discusses the following propositions:—

1. "Soils naturally poor, and rich soils reduced to poverty by cultivation, are essentially different in their powers of retaining putrescent manures: and, under like circumstances, the fitness of any soil to be enriched by these manures, is in proportion to what was its natural fertility.

2. "The natural sterility of the soils of Lower Virginia is caused by such soils being destitute of calcareous earth, and their being injured by the presence and effects of vegetable acid.

3. "The fertilizing effects of calcareous earth are chiefly produced by its power of neutralizing acids, and of combining putrescent manures with soils, between which there would otherwise be but little, if any, chemical attraction.

4. "Poor and acid soils cannot be improved durably or profitably, by putrescent manures, without previously making them calcareous, and thereby correcting the defect in their constitution.

5. "Calcareous manures will give to our worst soils a power of retaining putrescent manures equal to that of the best; and will cause more productiveness, and yield more profit, than any other improvement practicable in Lower Virginia." (p. 30.)

These propositions contain the marrow of the Essay, which is closely reasoned, and, in several particulars, original. Mr. Ruffin has the merit of first pointing out that there can be no such thing as a naturally fertile soil, without the presence of calcareous earth; but, where this earth is present, the soil, however exhausted it may have been by culture, will, when left to itself, after a time regain its original fertility: that soils which contain no calcareous earth are never found naturally fertile, except mosses, or beds of vegetable matter, which are not properly soils: and that all that art can do

to them, exclusive of adding calcareous earth, is, to force crops by putrescent manures; but that, when these manures are withheld, the soil will speedily revert to its original sterility. Mr. Ruffin observes that no agricultural or chemical writer ever denied these facts; but he asserts, and we think with truth, that by not one of them have they ever been distinctly stated. We are not quite certain as to Grisenthwaite, but we are so as to Kirwan, Dundonald, Davy, Chaptal, and other agricultural chemists of the Continent. Mr. Ruffin allows that it might be inferred from the ingredients exhibited by the analyses of fertile soils, as given by these chemists, that calcareous earth was an ingredient essential to permanent fertility; but still none of them have ever distinctly said so. We shall probably examine the work more in detail hereafter: in the mean time, it is due to Mr. Ruffin to state it as our opinion that he has performed a very important service to the scientific agriculturist in this country, as well as in America.

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### THE SALIVATING QUALITY OF GREEN CLOVER, AND CLOVER HAY.

To the Editor of the Farmers' Register.

May I inquire, through the Register, of you, or some of your subscribers, if clover has any inherent property whichcauses it sometimes to salivate? If so, what is it? and how may the cause which produces this effect be neutralized? When it salivates in the green state, will it always do it in the dry or cured?

It was my opinion that clover hay would never salivate; but my crop of last year, (cut from river bottom when the clover was in full bloom, cured in slender tall cocks, or mostly so, leaves and blossoms pretty well preserved, and but little altered,) is almost worthless as a feed for either horses or cattle. Both will eat it well for a few days, then appear to become sick, and then refuse it altogether if they can get any thing else. If confined to it, they become salivated. A part of the crop was salted when it was stacked, but little or no advantage was derived from it, except that sheep preferred that salted to any kind of hay I had.

A SUBSCRIBER.

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From the Tennessee Farmer.

### CULTIVATION OF SWEET POTATOES.

In the cultivation of every thing, we should consider of what kind it is, to what climate it belongs, and what kind of soil is best adapted to its production. From a neglect to consider these things, many unsuccessful efforts have been made to raise the sweet potato. The sweet potato is a native of a warm climate, and of a light sandy soil. We should then, as far as possible, endeavor to combine these two things, by a judicious selection of a piece of ground upon which to raise them. I will give you the plan which I have adopted in raising sweet potatoes, which has been very successful. Perhaps some who have heretofore failed, may be enabled to succeed better, by adopting it.

Some time in March, when I think the hard frosts are over, I take my potatoes from the cellar, where they have been kept through the winter. I prepare a bed in my garden, by levelling the surface of the ground: I then spread my potatoes over it, until they are not more than two or three inches thick: I then cover them with the rich surface soil, just so deep as I think necessary to prevent their being injured by light frosts. In this situation I let them remain until the season for planting.

Early in the spring I select what I suppose will be a suitable piece of ground. In making this selection, I chose a piece which lies fair to the sun, is tolerably rich, and considerably sandy. I break it up deep, and then let it remain until I wish to plant, which is some time between the middle of May and the first of June. I then plough again, and harrow well, so as to make it as mellow as possible. I then take a one-horse bar-share plough, and ridge up my ground by throwing three furrows together. This done, I cross it with a single furrow at the distance of about three feet. A very slight operation with the hoe afterwards prepares my hills, for I do not want them very large, nor high. I now go to my bed, and find my potatoes are all nicely sprouted, and those nearest the surface are up, and some of them have two and three leaves; but none, or but few, have yet any roots. I carefully remove the earth so as not to break the sprouts from my potatoes—for if they are broken off, they are destroyed. I put two or three potatoes in a hill, according as they are large or small, being careful always to leave the tops of the sprouts out of the ground, or near the surface, as they may be more or less advanced—so that when I am done planting, my potatoes are up, or nearly so.

You are now ready to inquire of me what I have gained by this process? I answer, several things. First, my hills are now light and mellow and ready to receive and nourish the young roots when they start—not baked, or rendered compact by the heavy spring rains. Secondly, I have completely subdued the grass and weeds, for they all had started to grow between the time of breaking my ground and the time of making the hills. I have then avoided all the trouble and labor of scraping down the hills two or three times before the potatoes are up, or while they are so small as not to admit of being hilled with the hoe. Thirdly, the earth and the season have now become warm, and my potatoes grow up rapidly. I work my potatoes in the following way. When the vines have elongated half way down the hills, I pass twice between the hill, each way with a bull-tongue plough; this mellows the ground. I then with a hoe, cover, say one third of the vine, leaving the remainder out, but yet so as not to make the hill very large.—This is all the work they require; for before the grass and weeds have time to start, the vines have so covered the ground as to smother them. Two years ago I did not plant my potatoes until the 7th day of June. The season was unfavorable; yet I made a fine crop, and the largest potatoes of the kind I have ever seen in Tennessee.

A SMALL FARMER.

*Hopewell, Feb.* 10, 1836.

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### ON STALL FEEDING.

Extract from a *Summary of Practical Farming*, a new English work, by C. HILDYARD, Esq.

*Stall Feeding*, which has now become so much

more common throughout the country than formerly, has had the effect of making meat, in most years, as cheap in the spring as in the autumn, which it used not to be; consequently, stall-feeding, of late, has seldom turned out to be profitable, but often, as I have experienced, a serious loss. Meat cannot be laid on lean beasts in the stalls, to repay the expense of the food they consume; the only chance of making stall-feeding answer, is, to put in the beasts which prove to be only three parts fat at the latter end of autumn, when grass will no longer improve them, but which will, in the stalls, increase in their weight, and improve in the quality of their meat; still, however, if the price of beef when these beasts become fat should be the same as when they were put into the stalls, the expenses will not be repaid. Meat must be a penny a pound more in the spring than it had been in the autumn, to repay the great expenses of stall feeding. It is carried on to a very large extent in Norfolk and Suffolk, and although from the great expense of oil-cake consumed, the farmers certainly must lose by every beast they feed, still they must continue the system on their large arable farms, for the purpose of turning their straw into good manure.

On beasts being tied up, white turnips will do for the first week or so; they keep beasts cool inside, but there is so very great a proportion of water in them that they are not of half so feeding a nature as Swedes. Those who have mangel wurzel should keep it as a *corps de reserve* for spring, or severe frost, when the turnips are frozen, which are often given to beasts almost as hard and as cold as stone, and which, in such a state, cannot be good for them. The turnips should be cut—there are many machines for cutting or slicing. The machine I use, and like better than any I have seen, I have had five and twenty years; it was made at Banbury, turns very easily with a large fly wheel, and cuts the turnips very expeditiously into irregular pieces, which I prefer to slicing them. My method of feeding, when the beasts have been up a little time, and when on what I call full feeding, is thus:—first feed in the morning, half a bushel of cut turnips, and afterwards half a bushel of cut hay, with about a quart of meal in it. These feeds repeated at noon; in the afternoon a feed of turnips, and supped up at night with hay in the rack, and three oil-cakes in the manger. Should oil-cake be cheap, give more of it, and less of meal. The difference of the weekly cost of my way of feeding is as hereinafter stated.

Oil-cake at £12 per thousand in London, with the cost of about $2 per thousand getting home, will bring the cost of each cake to very nearly three pence halfpenny. At £10 10s. to three pence.

The different weekly cost of feeding for each beast will be as under:

| | s. | d. |
|---|---|---|
| 10½ bushels of turnips, - - | 3 | 6 |
| 1¾ cwt. of hay - - - - | 5 | 10 |
| | 9 | 4 |
| Turnips - - - - - | 3 | 6 |
| 1½ cwt. of cut and uncut hay - | 5 | 0 |
| Half a bushel of meal - - | 2 | 0 |
| | 10 | 6 |

| | s. | d. |
|---|---|---|
| Half a bushel of linseed - - | 3 | 6 |
| Three gallons of meal - - | 1 | 6 |
| 1¼ cwt. of cut and uncut hay - | 4 | 2 |
| Turnips - - - - - | 3 | 6 |
| | 12 | 8 |
| 21 oil-cakes, at 3½d. - - - | 6 | 0 |
| Three gallons of meal - - - | 1 | 6 |
| Cut and uncut hay - - - | 4 | 0 |
| Turnips - - - - - | 3 | 6 |
| | 15 | 0 |

No food can be given to stall-feeding beasts that will fatten them so soon or so well as linseed oil-cake. It certainly is expensive feed, but not so expensive as it appears to be, taking into consideration that it fattens quicker. The expense of it, compared with other stall-feeding food, is thus: when it costs the consumer at home £12 10s. per thousand, each cake said to be 3lbs., (but never are quite so much,) the stone of 14lbs. costs 1s. 3½d. Linseed at 56s. per quarter, 1s. 11d. Barley meal, when the price of good grinding barley is 26s. per quarter, the stone will be about 11d. The stone of bean meal, when beans are 32s. per quarter, the same. Some winters I have fed with linseed instead of cake, and found it answer very well, although it added to the trouble of feeding. My mode of preparing it has been to break it in a little hand-mill, and steep it in cold water, in seven tubs, of a size sufficient for one day's feed; in this way it will have been steeped seven days before it is mixed with cut hay and barley, or (that which is better,) bean meal. If steeped in hot water, two days will do; if steeped longer than three, it is apt to get a little sour, which I think not quite so well for the beasts. There are annually great importations of linseed from which I conclude that it can be imported at a less price than it can be produced here. It is grown pretty extensively in some parts of the kingdom; it is, however, to be regretted, that the cultivation of it cannot be more general, and prevent the necessity of such great importations; and thus circulate amongst the English farmers a large sum of money which now finds its way into the pockets of foreign farmers. I have not yet made such use of wheat in feeding as to enable me from experience to speak decidedly about it. I have hitherto used only my tailing wheat, ground with barley, and thought it answered very well; but I hear of numbers of beasts being now fed entirely with wheat; and, it is said, quite as well fed, and at a much less expense than with oil-cake at its present price. The way of preparing it for feeding is thus:—steeped thirty-six hours; then laid for five days on a brick floor, turning it over once a day; then laid on a boarded floor, about six inches thick; in two days it will be fit for use. One gallon and three quarters in the grown state, per day, for each beast,

is said to be about equal to one bushel per week of of dry wheat. Having lately seen one ox that was said to have been entirely fed on wheat, leaves no doubt in my mind that it must be a very nutritious food for beasts; I cannot however, restrain some feelings of regret that this grain, intended only for the use of man, should be thus appropriated. Most likely, after two more harvests, the price of beans and barley will correspond, as it used to do, with the price of wheat, and then it will no longer be given as food for beasts. After all the great trouble and expense of stall feeding, this mortifying circumstance has frequently occurred; the beasts are sold in the London market at a ruinous price to the stall-feeder, at less than they would have made in any other market; the butchers knowing that the beasts, having been so much knocked about in Smithfield, could not be turned out of an overstocked market to come into the next, have frequently bought them at their own prices. It will not be thus when the Islington market is quite established.

I have given rather lengthened details of stall-feeding, from its having been for some years my hobby; but I confess rather an expensive one. No fox-hunter, however, can look with greater pleasure on his stable of fine hunters than I have at my stalls of fine beasts. I have tied up, several years, in the course of the winter, one hundred and fifty beasts; at this time (December, 1835,) I have only forty, chiefly well-bred Durhams, grazed in this county, and I never had beasts that improved faster. I have some fine Herefords, bought good meat at Hereford October Fair, but from the drift home (as is always the case,) they made little progress in feeding in the first three weeks of their being tied up. If beasts that are put up in warm places to stall feed have a great deal of long hair on their chines, top of their shoulders, and necks, it is a good plan to cut it off, for when the beasts are thriving, they perspire much in their fore quarters, the long hair consequently gets matted together, and makes them very itchy and uncomfortable .Brushing also tends to their comfort and expeditious feeding.

Many beasts are subject to be blown after eating their green food: in such case let them be kept moving in a yard till the swelling goes down. If cutting to let the wind out be necessary, it should be done with a penknife on the left side, between the haunch-bone and the first rib.

It is not very probable that either grazing or stall-feeding will ever again prove a profitable concern. Great quantities of fat beasts and pigs will be imported from Ireland, even should the condition of the Irish poor improve so decidedly that the consumption of meat be increased two-fold; for Ireland would still be capable of producing a sufficient quantity for export to depreciate the price of stock in this country. Those will have the best chance of making a profit of grazing who can get beasts forward in winter, and who have rich grazing land to make them early ready for market, there being generally a fair demand for good beef in the months of July, August, and September. Times will not admit of giving exorbitant prices for fancy breeds; still, however, I have found that it well answers to give something more for beasts which evidently show some good brreeding, as such will fatten much sooner than mongrels, and, therefore, at less expense; and, although there is not now the same difference as there used to be in the price of meat of various qualities, yet the finest is most readily sold at the top price of the market. There cannot be a question but that in the large breeds of cattle, the competition is between two breeds only—the Hereford and the Durham. I retain the same opinion as to the merits of these two excellent breeds, as I expressed more than twenty years ago. For grazing, I prefer Herefords—for stall-feeding, Durhams; having found that the latter increase faster in weight, and that if highly fed, they become more even carcasses of beef, and are less likely than many of the Herefords to prove patchy. It must, however, be admitted, that from their large frame they consume more food than Herefords. My idea of a good beast is, that it should have a straight and flat back, projecting hips, deep fore quarters, wide chine, sloping shoulders, good head, with prominent eyes, deep and bowed ribs, projecting bosom, good purse and flank, and not thin thighs.

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From Thompson's Records.

### NATIVE COUNTRY OF MAIZE.

Roulin, Humboldt, and Bonpland, have noticed this plant in its native state, in America, and have hence concluded that it was originally derived from that country. Michaud, Daru, Gregory, and Bonafous, state, that it was known in Asia Minor before the discovery of America. Crawford, in his History of the Indian Archipelago, tells us that maize was cultivated by the inhabitants of these islands, under the name of *djagoung*, before the discovery of America. In the Natural History of China, composed by Li-Chi Tchin, towards the middle of the sixteenth century, an exact figure is given of maize, under the title of *lachou-cha;* and Rifaud, in his "Voyage en Egypte, &c., from 1805 to 1807," discovered this grain in a subterraneous excavation in a state of remarkably good preservation. M. Virey, however, refutes these statements, (*Journal de Pharmacie*, xx. 571) by showing that these authors have mistaken the *holcus sorghum* for maize, and that the maize of Rifaud is the *holcus bicolor*, a native of Egypt according to Delile. Where maize occurs in the east, there is no proof of its having been carried there previously to the discovery of America.

*Maize*, (Zea mays) therefore sprung from America; *millet*, or *couz couz*, from Africa; rice, (*oryza sativa,*) from Asia; and wheat, barley, and oats, from Europe.

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From Jameson's Journal.

### PROGRESSIVE INCREASE OF TEMPERATURE AS WE DESCEND IN THE CRUST OF THE EARTH.

For the purpose of ascertaining whether a constant stream of water could be obtained by means of an Artesian well, sunk on the south side of the Jura mountains, at the distance of about a league from Geneva, and at an elevation of 297 feet above the level of the lake, M. Giroud, at his country residence at Pregny, bored to the depth of 547 feet without success. Despairing of success, he offered great facilities to any persons who might

wish to prosecute the enterprise, for the purpose of scientific inquiry.

On this occasion MM. Aug. de la Rive, and F. Marcet made a successful application to the friends of science, and also to the government, and funds were obtained sufficient to enable them to continue the operations during eight months, and to extend the boring to the depth of 682 feet. The hole bored was about four and a half inches in diameter. Water began to appear in it at the depth of twenty feet; and it is worthy of remark, that the height at which the water stood in the opening, as measured from the surface, was lower when the greatest depth was obtained, than it was at half the depth. At 275 feet of depth, the water stood at 14 feet from the surface; at 500 feet it sunk to 22 feet; at 550 feet, to 35 feet. It then rose. At 595 feet, it stood at 24 feet 6 inches, but at 675 feet, it again sunk to 35 feet 8 inches. The result of this praiseworthy effort must operate as a salutary preventive from any farther expensive attempts to obtain running fountains, from the theory of an internal communication with the springs on the summits of the Jura.

Having attained the extraordinary depth above mentioned, the experimenter devised the means of ascertaining the temperature of this opening at different depths. As the common thermometer would not answer the purpose, they contrived a self-registering thermometer, constructed on a large scale, and whose accuracy was subject to the most satisfactory tests.

The following table exhibits the temperature of the bore-hole at the depths specified,

| Depths below the surface in feet. | Corresponding temperature. |
|---|---|
| 30 | 8.4 Reau. |
| 60 | 8.5 |
| 100 | 8.8 |
| 150 | 9.2 |
| 200 | 9.5 |
| 250 | 10.0 |
| 300 | 10.5 |
| 350 | 10.9 |
| 400 | 11.37 |
| 450 | 11.73 |
| 500 | 12.20 |
| 550 | 12.63 |
| 600 | 13.05 |
| 650 | 13.50 |
| 680 | 13.80 |

It thus appears that the increase of temperature below the depth of 100 feet from the surface, as far down as 680 feet, is precisely 0°.875 of Reaumur (=1°.968 or 2° Fahrenheit, very nearly,) for every 100 feet. It will be observed, that the increase, instead of moving *per saltum*, as in some other cases, moves with remarkable uniformity. This, the experimenters think, may be owing to the care which was taken in this case to remove and avoid every source of error.

This experiment appears to be the first attempt to ascertain, with any accuracy, the temperature of the earth at considerable depths, among the mountains of Switzerland. The geological structure of beds which were bored through on this occasion, was as follows:—Next to the upper layer of vegetable earth, sand and gravel, was a gravelly and bluish clay, mingled with soft sandstone (*molasse.*) Below 120 feet commenced a succession of beds of marl and soft sandstone, of various thicknesses, which continued without interruption to the termination of the boring, 682 feet. At 220 feet there was a bed of coarse sandstone (*molasse grossiere*) two feet thick, with rolled pebbles, a remarkable fact, considering the depth. A strong fetid sulphurous odour was also observed in the layer of yellow marl mixed with sandstone, at the depth of 280 feet, that is near the level of the lake, and a grain of salt was found in the sandstone at this depth. The sulphurous odor again appeared at 600 feet, without the presence of any sulphurous compound that would account for its origin.

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### ON RAISING HAY.

To the Editor of the Farmers' Register.

You will oblige me by inquiring through the medium of the Register, whether hay has ever been introduced into a rotation on any large farm south of Mason and Dixon's line. I refer, exclusively, to upland hay, especially Timothy, and should be exceedingly gratified to ascertain if it has been raised for market in the section of country above mentioned, and the circumstances connected with the raising and marketing.

TIMOTHEUS.

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### LIMING IN FAIRFAX. EARLY HOUSING OF CORN.

To the Editor of the Farmers' Register.

*Fairfax county, April 12th.*

As cold and obstinate as the spring is, our wheat and rye looks better than usual, and gives promise of good return for our labors. Our preparation for the corn crop is backward. Tired of the tedious process of improving land by plaster and clover, I have purchased oyster shells, at a neighboring town, hauled them seven and a half miles, burnt them, and strewed 50 or 60 bushels to the acre over 65 acres of corn land, and shall apply burnt shells to the checks of 35 acres more. If this last experiment succeeds, I shall thus apply the shells I can obtain another year, as it is next to impossible to lime in the broad cast for less than $10 or $12 per acre. I have already devoted 36 years to the improvement of my farm, without much regard to expense, or the result, provided I believed my march was onward. Strange as it may appear, though some of my fields will produce full ten times the quantity they did 36 years ago, (and the fact can be proven in any competent court,) I could not now obtain for it as much as it could have been sold for 36 years ago. So much for "progressive society."

Man was instructed by the great Master of Christianity through his apostles to "see that nothing was lost." In full respect to this command, I have been making fences for two winters out of the brush of the pine I have cut for burning shells, and for fuel; and I now have miles of it, a good and secure fence upon the verge of a good ditch. Under the influence of the same command, in preparing to house my corn last October, I had to take down a house which was built of logs sawed out

of willow oak, which was built full fifty years ago. The lockings, or intersections at the angles, were rotten: they were cut off, and a new house built of the logs, and I have no fear of its not lasting 50 years more. Yet this very willow oak is hardly worth cutting and mauling for farming use. My corn houses are built with a view of housing my corn in October, and I may add, much is housed in September. They are three in number, built of logs, resting from 6 to 9 inches apart, and lathed inside or out. At or about the Equinox, I begin to gather, husk and loft—taking care to move from house to house, day after day, until I am done. The "lofted" corn never injures. The green and rotten must be watched: but as I feed 12 or 14 horses, 50 hogs, and some beeves, no very great store of that is ever on hand.

X. Y. Z.

[It may be presumed that the houses of X. Y. Z. are unusually narrow, to render safe the keeping of corn put up so early. The last crop of corn (of the soft kind commonly made in lower Virginia) was so imperfectly dried at the usual time for gathering, that many persons, and even those who were aware of the threatened danger, (and took what were thought sufficient care to guard against it,) suffered more or less of loss. No other crop of corn has been so late in getting dry enough to shell, and to remain in bulk for sale, since that made in 1816. The safety of the crop of our correspondent, under such adverse circumstances, causes this part of his communication to be more important than perhaps he was aware of—and we shall be pleased if he will add a more particular statement of the size of his cribs, the kind of corn cultivated, and also, if remembered, how early he began to put up the crop, last autumn, and what was its state, as to dryness, this spring.]

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## HEALTHINESS PRODUCED BY MARLING. ITS INTRODUCTION INTO DOMBE, AND OTHER UNHEALTHY COUNTRIES, RECOMMENDED.

Translated for the Farmers' Register, from the *Essai sur la Marne*, of M. Puvis.

The results of marling may be considered in a point of view more elevated, and still more important, than that of the fertility which it gives to the soil: they may perhaps have much influence on the healthiness of a country where it becomes a general practice.

Although it may not have been yet uttered by others, this opinion appears founded on strong probabilities, on strong analogies and precise facts, all of which appear to give it a sufficient certainty.

It is known that the calcareous principle is one of the most powerful agents to resist putrefaction. It is employed to make healthy, places inhabited by men and animals, in which sickness or contagion is feared; it serves to neutralize the emanations of dead bodies undergoing putrefaction; it destroys the deleterious effects which escape from privies, and which sometimes cause the death of those who are employed to cleanse them.

It even seems that calcareous countries are only unhealthy when they are interspersed by marshes, or when some causes, foreign to the soil and climate, determine the unhealthiness, as in countries on the borders of the sea, where the flowing of the tide, and the mingling of salt and fresh waters, infect the air by the deleterious emanations of their combination. This cause of unhealthiness is regarded as a certain fact; for salubrity is generally seen to appear whenever this mixture of waters is prevented.

In the valleys of rivers bordered by calcareous mountains, which enclose unhealthy countries in their interior, insalubrity commences there only as the calcareous soil, which is attached to the mountain, gives place to silicious soil. In the same plain, and far from a mountain, salubrity is seen to diminish in the same proportion that the calcareous soil of the surface does; and the *communes* of Bresse, which have an abundance of marly or calcareous soils, are much more remarkable for their salubrity than those on the white lands (*terrain blanc**). While the ponds of Dombe, which are on the silicious soil, appear to be one of the greatest causes of unhealthiness, those of Bresse, which are on calcareous lands, do not show such effects in the country where they are found: so, likewise, the ponds of the country situated between the Veyle and the Reyssouze, to the north-west of Bourg, which are generally on calcareous soil, do not appear to injure the healthiness of the country in any manner.

For the support of this system, we will also cite the ponds of Berri on calcareous soil, whose emanations have nothing unhealthy; the laying dry of the ponds of Parracay, in the canton of Lignières, has added nothing to the healthiness of a calcareous country naturally healthy. And in the same canton, the pond of Villiers, which is said to be seven leagues in circumference, does not cause diseases on its borders. Besides, during the month of August, the water of the ponds on calcareous soil does not become blackish, as often happens in silicious ponds. The water would then be made wholesome by the calcareous principle, in the same way as their emanations.

In fine, Dombe, and Sologne, and a number of other countries are unhealthy, and subject to intermittent fevers without being marshy; but their soil is likewise silicious, and the land moist. Puisaye, and a part of Bresse, in similar land, which contain little or no calcareous soil, have also many autumnal fevers.

Without pretending to explain, entirely, facts so remarkable, we will, however, observe, that the calcareous element, possessing a great force for combining with the principles which are encountered in the soil, may very well hinder the formation, or hasten the decomposition, in the bosom of the earth, of these substances so little known, which, having become volatile and breathed by man, or acting in every other manner on his organs, dispose him to receive disease.

These deleterious substances, which infect the

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* The reader of M. Puvis' essays on lime and marl, which were inserted in Vol. III., will remember, that this provincial term, and others (*plateaux argilo-silicieux*, &c.) are used to designate a peculiar kind of soil, destitute of calcareous matter, stiff, intractable, and poor—and which seems precisely of the character of the poor ridge lands of lower Virginia, to which calcareous manures are so peculiarly adapted. Ed.

air of unhealthy countries, can take their rise only from the ground; for the soil alone distinguishes an unhealthy country from the neighboring regions which are healthy. All other circumstances of the atmosphere, temperature, its variations, and climate, are common to both; the unhealthy country is constantly exchanging its vitiated air for the pure air of its neighbors. It follows then, of course, that the unhealthy exhalations of the soil should be constantly renewing the injurious principle which beneficial winds tend to carry elsewhere.

We will add to the foregoing remarks, that this calcareous principle, possessing a great force of absorption on the constituent parts of the atmosphere, may seize on the deleterious principles themselves, which will have escaped its interior action, and decompose them for the profit of vegetation; that this principle, as we have heretofore seen, by making vegetation more active, increases the force of absorption of the plants, and favors the advancement of leguminous plants which live principally at the expense of the atmosphere; that this vigorous vegetation tends, as it is known, to make the air healthy; either by emissions of oxygen, or by the absorption of carbonic acid, or by some other means, which nature has kept a secret.

We will remark again, that the waters which spring from calcareous mountains, and which are more or less charged with the calcareous principle, conveyed over marshy meadows, invigorate them, and make leguminous plants and grasses grow there. Calcareous waters, then, make the soil healthy, and the soil made healthy in its productions, will be likewise so in its emanations.

Besides, the soil too moist under cultivation, as we have seen before, is found invigorated by marl; its products become those of healthy soils: waters that remain there, are then also modified, as well as the soil. In moistening the marled soil, these waters are charged, more or less, with the calcareous principle, which they transmit with the sap to vegetables: they are then, themselves, made healthy and capable of giving health, since they become favorable to vegetation, instead of being unfavorable, as before marling.

M. Garnier, engineer of mines, in his excellent work upon the borer and its use, admits, in accordance with the observations of Linnæus, as a principle of experience in the art of the well-borer, that waters, which run over beds of clay, are often unhealthy or impure, while those which spring from calcareous beds are light, clear, and very healthy. A number of reasons, of greater force, bring us to the conclusion, that waters are made healthy by the calcareous principle.

In fine, (especially in Dombe,) in driving away the growth of silicious land to replace it with leguminous plants, the calcareous principle would destroy this plant with the cadaverous odor—this atal *flouve* which covers and exhausts all the surface of the fields after harvest—which infects the air with its pestiferous exhalations, and which we must regard as one of the principal causes of the sickliness of the country.

It would be an insufficient opposition to say, that a small addition of calcareous principle to the soil could not affect the general unhealthiness of the country: on the contrary, it seems that this ought to be the most active means that could be employed; for, we have seen before, that the deleterious exhalations, which are mixed in the air that we breathe, and which infect it under the gaseous form, proceed from the soil; and we ought to think that it is from the upper or cultivated layer, because the lower, which the water could not penetrate, could no more give passage to the gaseous emanations.

Besides, we cannot imagine an action more direct, more close, and more intimate, than that of marl on ploughed land. One conceives that it can attack the unhealthy principle in the soil, as well, and in the same manner, as lime water, or slaked lime, destroys them, in habitations, on dead bodies, and in privies. These great effects are produced by a single and superficial application, while the addition of marl is made, and acts on every part of the ploughed bed; and it is in their own laboratory, before they can be formed, and even in their elements, that the principles of insalubrity are attacked.

In short, the calcareous principle which changes the nature and productions of all the vegetable mould, ought necessarily to change the combinations, and modify the elements of them. The emanations of the soil, which are the result of these combinations, ought then to change also; and these emanations ought to cease being unhealthy, because the general and known effect of the calcareous principle is to give health.

The opinion, that considers the calcareous principle, and consequently marl, as one of the great causes of health, although it may not have yet received its sanction from the experience or discussion of enlightened men, is, then, not only supported by conjectures, which explain and render it probable, but is also founded on facts, which give it, to all appearance, a great degree of certainty.

It would be then under the double report of salubrity and fertility, that we can consider the introduction of marl into Dombe, or in analogous countries; this double end ought to sustain our efforts, and we would reap, from our labor, a sufficient recompense, if we could aid in inducing the introduction of marl into this important and unfortunate portion of our conntry.

No one doubts, at the first glance, that marl is suitable to almost all the extent of the unhealthy country: its soil is almost all entirely moist and argilo-silicious in composition, on which marl displays the greatest activity.

This country forms a triangular flat, placed between the Saône, the Ain, the Rhône; its two largest sides follow the direction of the Saône, the Ain and the Rhône, and its base rests on what is properly called Bresse. Its situation, near a great outlet, and on two navigable rivers, seemed to have destined it for great prosperity; but its inferior soil, and its unhealthy climate, cause very little profit to be made from its happy position.

This country could possess all the advantages of its position, and become healthy and fruitful. For this purpose, we would think it would suffice to give to the soil the calcareous principle which it wants. This amelioration is possible, through the means of marl, for a sufficiently great extent of this country. We have seen, formerly, that when marl is found in some parts of a basin, there is some certainty of its being found in other parts.

As marl is abundant in the particular valleys of the Saône, the Ain, and the Rhone, and part of this country lies in the basins of these three rivers,

it ought also to be found there. Guided by these ideas of analogy, I have myself found it between Chalamont and Mcximieux, and in the environs of Chalamont. M. Rivoire has sent me some from Rigneux, which contains 60 per cent. of carbonate of lime. It is found in the little valley of a rivulet which passes St. Eloi: that which passes Chalamont contains it also in great abundance; and it remains proved to me, that the valleys of the small tributaries of the three large rivers contain it in Dombe, as in Bresse; that, if there is no marl yet discovered on the table land, it is because on flats, much elevated above the course of the three rivers, it would be perhaps found at a very great depth, which would render its extraction difficult enough, on account of the water. which could run in the work. However, there are no certainties on this point; and the country onght to be explored on the table lands, in this point of view, where, perhaps, would be found, as in Bresse, marly veins showing at the surface of the declivities. The borer would be very usefulfor this purpose, taking care to direct it where sand would be found.

If it happens, which is very likely, that no marl can be found in the interior on the table lands, the bottom of the valleys of the three great rivers which surround this country, and the first range of hills which border the bottom of the basins, contain it in large quantities, and can furnish continual supplies for the interior. Besides, the country is furrowed by small rivers, in whose channels or basins much of it can be seen. With these resources alone, a considerable part of the surface could be ameliorated; and if bad roads, moist climate, and the craggy soil, prevented the transportation of marl in the interior, lime, which is the vivifying principle of marl, could supply its place. We propose to estimate, hereafter, this resource, which has changed the face of so many districts of analogous soil in France and other countries.

We ought not to conclude on this subject, without observing that marl, to diminish sensibly unhealthiness in the whole of a country, ought probably to be extended to a great part of its surface. The marl of each farm would cause a diminution of unhealthiness, according to what we think, for that property itself and its inhabitants: but they would still suffer from the unhealthy emanations of the neighboring places, which had not been marled. Salubrity would increase in proportion as the general marling would increase; and when the whole surface would experience the benefits of marl, then, with the healthiness which would preserve individuals for labor and increase of the population, with the fecundity which would offer the greatest products without being obliged to increase the labor, we would see the country advance rapidly towards a better future. Then, by the force of things, and at the same time that the marling would develope its results, we would come to the draining of the greater part of these numerous ponds, which would be the only remaining source of unhealthiness. The ponds which, for ages, receive, by means of the waters, the manure of the surrounding land, would soon be made, some, good meadows, and others, the best cultivated lands of the country; and these lands, provided with accumulated vegetable matter, by receiving marl, would be made healthy and fruitful. This country has very few marshes. Almost all of the ponds are drained, first to obtain the fish, and then to be cultivated; and, consequently, they contain no water. The marshy meadows themselves, which are at the extremity of the ponds, would be drained and be made healthy by the draining of the former.

Besides, the table-land, which forms this country, is very much elevatedabove the valleys, of the two rivers which border it, and receive its waters; for the numerous ponds, which succeed each other, are the places where the waters meet, and consequently the lowest parts of each canton. But these low places have themselves a very great fall, as it is equal to the height of their banks, which are, on an average, ten feet high. The central part of the country, which separates, (in going from north to south,) the two flowings of the waters, the one towards the west in the Saône, the other towards the east in the Ain and in the Rhône, is then elevated above the countries which border these two rivers, in a measure at least equal to the sum of the banks of the ponds, which would be more than one hundred feet; for the number of these ponds is large. The country has there a considerable declivity, and, consequently, after the draining of the ponds, the rain water would easily run off, without forming marshes.

This country, freed from the greater part of its ponds, having a large portion of the soil made healthy, and purged from the infected *flouve* which covers it, cultivated by a population more numerous, stronger, and richer, would advance rapidly to prosperity, sustained by the market, which a city of 150,000 souls offers, it would bring, on its own soil, (which would have ceased to be deadly,) a part of the inhabitants of this city, which would also be enriched by the new addition of commerce. These inhabitants would come with eagerness to repose in the bosom of agriculture, in a country become healthy and fruitful, escaping from the embarrassments and cares of the earlier part of their lives; bringing with them their large capitals, they would draw thither hands for labor; they would give movement and life to all around them; they would develope industry in a country now abandoned, by a greater part of its proprietors, to the care of a scant and weak population, without any degree of energy.

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From the Southern Agriculturist.

### SALT MARSH GRASS AS FODDER.

*James Island, April 6th*, 1836.

I have frequently wondered that our planters do not give more attention, to curing salt marsh [grass] as a fodder for their horses and cattle. This is the more to be wondered at, when we reflect that hay is now selling at $2 per hundred. When will we begin to supply ourselves with our own provisions? When will we become independent of the northern markets? Is it because we have not the means at hand? I shall show you, Sir, that in one article at least, we have the means of supplying ourselves; and that too, not only well, but cheaply. I mean in the article of salt marsh [grass] as a substitute for hay.

For six or seven years back, I have been in the habit of curing salt marsh [grass] as fodder for my horses and cattle. I find that they prefer it when properly cured, to any other fodder which you can give them. It must, however, be *properly* cured, or, like all other fodder, your creatures will refuse it. This (April) and the two coming months, (May and June,) is the time for cutting the marsh. It is then most tender, possesses most juice, and will dry best. During these months, I keep a boy or two continually cutting. One boy will cut one or two boat loads per day; as the tide suits. As soon as cut, I have it well washed in the salt water; spread it out a day to dry in the sun; and immediately after, pile it up in stacks to keep. No apprehension need be entertained of its heating or moulding; as the salt in the marsh prevents every thing of the kind.

Marsh [grass] thus cured, will keep during the whole year; and in the winter will afford a fodder that horses and cattle will prefer to all others. Its advantages are many. Cattle that feed upon it, will seldom, if ever, be troubled with worms or cholic; since the salt in the marsh totally destroys the worms, and prevents the cholic. When given green to your horses in the spring, it will at first act upon them as a gentle purgative, but after feeding with it for a day or two, this effect will entirely wear away, and it will then prove one of the most rapid fatteners.

Few planters plant corn enough to afford them fodder for the cattle throughout the entire year. Let those who reside in the vicinity of marsh, cure this article as I have directed; and if they will take the word of one who has tried it, they will never want fodder, nor have to eat poor cattle.

TRY IT.

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From the Genesee Farmer.

### GOOSEBERRIES.

Unless we much misunderstand the signs of the times, the current of public opinion is at the present moment setting strongly against the imported, or, as they are more generally termed, English varieties of gooseberries. There can be two reasons assigned for this state of feeling, one of which is the great uncertainty which attends their fruit reaching perfection; and the other is the fact that in richness of flavor they are inferior to some varieties of our native ones. These objections in the main appear to be well founded, and as such, are certainly deserving the attention of those who wish to engage in the cultivation of this excellent fruit. That the English gooseberry sometimes arrives at maturity unaffected by the mildew, is certain; but the chance is very small that it will do so, and it is extremely tantalizing to the grower to see the plague spots spreading over his fruit, and at once placing them beyond the reach of hope. The attack of this disease, for such the mildew is, is the more disagreeable, from the fact that gardeners have as yet discovered no remedy in any measure adequate to the evil. While the native varieties remain untouched, the foreign kinds, standing near, are entirely destroyed. We had a few bushes last year, the fruit of which, with a few exceptions, was free from mildew, while a friend who had a fine row of them, and whose bushes were early in the season loaded with the fruit, did not gather one that was fit to eat.

While all admit they are much larger and fairer, and when free from mildew a most splendid fruit, still to our palate the foreign varieties lack that condensed richness and fragrance which belong to some of ours; and beauty, though a good thing in itself, can hardly be considered a fair set off for flavor when the palate is to be the judge of merit. On the table we are sensible a plate of our half prickly wildwood fruit can hardly compare with the round plump glossy skins of the English kinds; yet there are few, who, so far as taste is concerned, would not resolutely prefer those grown from our own native shrubbery. That these may be improved in size we have no doubt, and if it can be done without sacrificing flavor and richness, all would hail such improvement; but if this cannot be done, if each advance in size and beauty deteriorates them in quality, why then we say give us our old fashioned berries, smaller in size, but free from disease, and rich in all the qualities that constitute one of the most delicious fruits in the world.

G.

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From the Genesee Farmer.

### CURRANTS.

Among the great numbers of fruit-bearing shrubs and vines, there are few more worthy of notice, or which better repay the expense of cultivation, than the currant. It is an abundant bearer; of easy culture and rapid growth; and whether dried or fresh, is convertible to a great variety of uses in culinary operations. In this country we have three kinds; the red, which is the most common; the white or rather yellowish, since when ripe it has a slight yellow hue; and the black, which is chiefly cultivated and valued for its medicinal qualities. Of these varieties we much prefer the white; as the fruit is usually much larger than the red; it possesses more saccharine matter when ripe, and is consequently better adapted for the table; and from it a wine, by proper management, may be produced, superior to many of the imported wines. No man, however small may be the piece of land he owns and cultivates, should neglect the growth of the gooseberry, currant, &c. as they occupy little room, and contribute much to the comfort of a family, besides preventing so far the thankless business of begging fruit, or saving many a six-pence in its purchase. Currants are grown, where the roots are not to be procured, or where new kinds are to be introduced, by cutting shoots of six or eight inches in length, making a shallow furrow in the earth, and placing them at proper distances in a slanting position with one or two buds above the surface. In this way they will hardly fail of growing well. The earlier in the spring the operation of setting the shoots is performed the better; although they will frequently do well until the buds are fully swelled. Gooseberries may also be propagated in the same manner, though their growth is not quite so certain; and neither they or currants, when set in this way, require any other care than that the shoots should be kept clean of grass and weeds for a year or

two. In making selections for setting, none but the finest kinds for size and flavor should be chosen, as a bush the fruit of which is small and worthless will occupy as much room as one which unites all the good qualites desired.

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From the Genesee Farmer.

### THE HESSIAN FLY.

One of our new subscribers in Ohio, has expressed a wish to see a dissertation on the Hessian fly; and as it may be acceptable to other of our readers, we shall attempt to furnish briefly, the most important of the information which we possess respecting it.

This insect belongs to the order *Diptera*, which includes all those insects having only two wings, and to the genus *Tipula*. The number of species belonging to this genus are numerous, amounting to more than one hundred and thirty of those hitherto known and described, and as many of these resemble each other, care is necessary, in observations on the Hessian fly, that no mistakes are made in identifying the species.

The following description of the Hessian fly, (*Tipula vaginalis tritici* of Mitchill,) is given by Dr. Akerly, in the American Magazine and Critical Review, of August, 1817. "It is a very small black insect, not so large as the moscheto of this place,* with two fine transparent wings, from the roots of which, three ribs diverge, as through the leaf of a plant. The body, when examined by a microscope, is found to be divided into four segments, with a few hairs observable on each. The legs are of a yellowish cast, and transparent; the head inflected, with a short proboscis."

This, in common with nearly all other insects, passes through four distinct stages of existence: 1, the *egg;* 2, the *larva*, or maggot; 3, the *pupa*, or dormant state; and 4, the *perfect winged insect*. In this part of the country, it passes through two generations in one season, and attacks the wheat both in the spring and in the autumn. The fly, or perfect insect, deposites its eggs in the autumn, soon after the young plants appear above ground, between the lowest part of the leaf and that part which forms the main stem or straw, and as near the root as possible. "It resembles, at first, a very small white nit, and as it grows larger become a sluggish and almost inanimate maggot, of a white color. In this state, the proper and most natural food is the sap or juice of that kind of green wheat which has the most delicate straw."† It remains in this situation through the whole winter, apparently in the chrysalis state, without suffering any injury from the frost or snow; and in the spring, as soon as the weather becomes warm enough, and generally about the time vegetation has fairly commenced, it is transformed into the fly. In this state it performs the functions necessary for a continuation of its species. It lays its eggs between the straw or stem and the sheath which encloses it, as before described, and dies; and a new generation succeeds.

These eggs are soon hatched by the warmth of the season; and the young insects may be discovered in the form of small white maggots, within the sheath of the straw, and just above the lower joints. They here continue to feed upon the sap and tender fibres of the plant, by which it either withers and dies, or is stunted in its growth, so that the grain does not arrive at maturity. They are changed into the pupa state before harvest, and at this season, while the wheat is yet green, their presence may be readily detected by walking through the field and pressing the heads with the fingers; those which feel soft, and unfilled with grains, are those which have been injured by the insect; and if the stalk be examined, they will be found near the lower joints, somewhat resembling a flax seed, but smaller and slenderer, and of a dark brown color. They continue in this state till after harvest, and may be found upon the stubble in the field. Early in autumn they pass into their winged state, and lay their eggs in the young plants of wheat as before described.

When the fly is about to issue from the pupa into the state of perfect insect, it disengages itself by boring a small round hole through the brown case in which it is enclosed, and through the sheath of wheat just opposite to the place where it lodged, and this hole may be easily discovered as long as the stubble remains entire.

With regard to the time of undergoing its final transformation the first time in the season, Judge Havens observes, "the size of the maggot when full grown, and the time necessary to complete its growth, depend in a great degree upon the quantity of nourishment it may obtain from the grain, and the number of maggots that may happen to be on one straw. This, according to the best of my observations, is somewhere between four and six weeks, which will bring the time, in which its growth will generally be completed, to the first part of June. But here the several causes of variation in the time of its being laid in the wheat, and of its completing its growth, both conspire to render this time so various, that some will be full grown, and others transformed into a chrysalis [pupa,] while others are small; and this circumstance has no doubt led many skilful observers to suppose, that there are two complete generations of the insect before harvest." The second time that the fly issues from the pupa, depends also in a great degree, on circumstances. "It generally," says Havens, "begins about the 20th or 25th of August, and continues in a greater or less degree through the whole month of September; but by far the greater part of the species are without doubt transformed into a fly, in the first part of this latter month."

By understanding the history of this insect, we are enabled to apply the means for its destruction, or for escaping its ravages. As it remains upon the stubble in the pupa state after harvest, the first means to be used, is, to destroy the stubble soon after cutting the wheat. This is to be done either by ploughing or by burning. If by the former, the pupa is buried in the earth, and is thus prevented from changing to the fly; or if it changes, it cannot escape. Unless therefore, the stubble be completely buried, the experiment will not succeed, consequently the deeper the ploughing the better. If by the latter, the stubble must be entirely burnt in order that the destruction may be complete, for, as the insect lies near the root, it will escape, unless the fire be well applied.

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* Its body is about one-ninth of an inch in length.

† Havens on the Hessian fly, in Agric. Trans. New York, vol. 1, p. 77.

But the best method of preventing the mischief occasioned by it, is to sow so late, that the wheat will not be above ground, until the autumn fly has perished. As the fly is in the state of greatest activity early in September, the wheat which is up at that season, will be most liable to be destroyed; on the contrary, if the sowing is deferred till a month later, it will in a great measure escape. It is supposed that a single frost will destroy all the insects while in the state of the fly, and if the wheat is not up before such an occurrence, no danger whatever is to be apprehended.

In endeavoring however, to escape one calamity it is necessary to avoid the opposite evil. If the grain is sown too late, there will be danger, as is obvious, of its suffering from the effects of the frost of winter, or in other words, of being *winter killed.* Hence a middle course must be adopted. It may also be observed, that as there is a decided advantage in early sowing, where wheat is not attacked by the fly, it would not be advisable where no danger of such attack is to be apprehended, as is the case in some places, to sow late in order to avoid its ravages.

The best evidence in favor of late sowing, as a means of preventing injury from the fly, is experience. Among other instances, two are related by a correspondent of this paper in Pennsylvania, (vol. 3, p. 321,) who waited till the first autumnal frost, when his grain was sowed and covered as speedily as possible. The result was, that next harvest he had a good crop of excellent wheat, while the neighbors on each side of him, who sowed earlier, did not reap more than one fifth of the quantity, and that injured by the fly. The other instance was this:—One half of the wheat crop was first sown, when a heavy fall of rain took place, which retarded the sowing of the rest until dry weather with frost; when it was harvested, the first sown was scarcely worth taking into the barn, while the latter proved an average crop of merchantable wheat. In these instances, the effect of frost in destroying the parent insect, is obvious.

Although the *autumn* fly is considered as the cause of the far greater part of the mischief, much injury is often committed by the *spring* fly. This is more especially the case where the wheat is sown too *late* in the fall, and is not of sufficient vigor the next season to out-grow the effects of the injury. This is an additional reason for selecting a medium period for sowing.

In conclusion, therefore, we would recommend, as the best general rule for escaping the ravages of the Hessian fly, to sow, if the season and circumstances will admit, immediately after the first frost, on ground which has since harvest been kept clear from all vegetable growth* which might serve as a refuge for it, and never in any case to sow before the early part of October. But as additional facts brought to light by further experiments, cannot fail to be useful, we shall close this article by repeating the suggestion of Judge Havens:—"Let these who may have leisure and curiosity on this subject, and who reside in different parts of the country where the insect may prevail, sow small patches of different kinds of wheat, as often as once or twice in a month, during the whole season, adjoining to some field of wheat or stubble, where the insect may be found in greatest number; and let its progress be observed on those different patches of wheat, and the result of the observations be collected and compared with each other."

* It is not probable that this insect attacks any other than culmiferous plants; it is known to attack rye and barley, and possibly it may feed upon other plants of this natural order; if so, these would furnish a habitation for it through winter, unless they were destroyed.

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From the Southern Agriculturist.

## ON THE CONDUCT AND MANAGEMENT OF OVERSEERS, DRIVERS, AND SLAVES.

*Santee, April* 3, 1836.

*Mr. Editor,*—I received your letter a month since, requesting me to give you "my system in the management of Mr. —— plantation." Your letter I would have answered before this; but being now somewhat advanced in age, and not exactly in writing order, I deferred doing so until the present time. However, since you think an account of my system of management might benefit overseers generally, I shall comply, even at this late hour; for I do assure you, that nothing gives me greater pleasure, than to have it in my power to say or do any thing, however little, that will improve overseers in their regulation and management. Having been an overseer myself for twenty years, I think, I ought to know how important it is to them to be well informed as to their duties. But, Mr. Editor, this is not acting like a good overseer; I am not writing to the point in question; so without any more preface, I shall give you as the best outline of my system, an account of what you desire.

It was fifteen years ago, that I was first employed to overlook and superintend the plantation of Mr. ———. As a wise and conscientious man, Mr. ——— required of me testimonials as to honesty and activity of character. When I satisfied him as to these, he then, in a very explicit manner, told me, what would be required of me. Among an hundred other things, he impressed upon my mind, that I was to be his representative; to regulate his slaves in their moral and general conduct; to sustain my employer's reputation among merchants for the quality of his productions; and to make his plantation a pattern of regularity and order to the neighborhood around. When Mr. ——— began to talk in this way, I at first thought he was quizzing me. I had before been an overseer, but had never been spoken to in this solemn sort of manner. With other planters, when I showed that I was honest and active, that was enough—I was directed where I was to live, and my authority as overseer commenced, for evil or for good, for one year from that date. I say that when Mr. ——— first began to lecture me as to what he would expect of me, I thought him quizzing; but I soon changed my mind. I soon discovered that he meant every word he said; and moreover meant, that it should be attentively listened to, and executed. He told me that there was no duty more difficult than the one I was about to assume; accordingly, said he, we had better understand one another explicitly. He then recounted every thing he would expect of me; how I should demean myself; how I should

manage his slaves; nothing was omitted which he could think of.

Nor was Mr. ——— satisfied here. Most of my duties he had commmitted to writing, and I was required to keep them as a constant guide to me in the management of his plantation. Whether they were excellent or not, shall appear, when I speak of how I managed his estate; for let me assure you, Mr. Editor, that if I have been successful as an overseer, I attribute all, to the advice of my employer.

When I commenced my duties as overseer with Mr. ———, I was firmly impressed with the belief, that "knowledge is power." I felt that whether applied to the sciences, or to the pursuits in which I was embarked, that information of every kind was useful to me. Without being obtrusive, therefore, I determined to pick up from every planter and overseer, what I could learn as to my business. I found that the most ignorant man could teach me something which I had not known before. What I learned, I always submitted to my employer, when I could do so with convenience. Sometimes he would dissent from what I proposed; and then I was never ashamed to argue the point with him, and show him the reasons why I thought myself correct. I pursued the same plan with the driver. Whatever I was to do, I always consulted him about. This gave him confidence and responsibility in himself, and character in the eyes of those he had to superintend.

Speaking of the driver, brings me to notice my management of him more particularly. I always required of him, that he should dress myself better than the other negroes. This caused him to maintain a pride of character before them, which was highly beneficial. Indeed, I constantly endeavored to do nothing which would cause them to lose their respect for him. With this view, I made it a rule never to scold or lecture my driver before the other negroes for any inadvertence or fault. If he did any thing which was out of the way, I took him by himself and lectured him severely. If the fault was of a flagrant nature, as was once the case with him, I publicly flogged him before the other negroes, and disgraced him by appointing another in his place. I would never listen to every tale that the negroes might have against the driver; but whenever they could urge any thing which seemed plausible or correct, I would consent to have him tried. At these trials, I would preside as umpire—would listen to the evidence for and against, and my decision always awarded a punishment of some kind to the guilty party—to the driver, if guilty, or to the accusers if they did not make good their charges. Persons might suppose that the fear of not making out their case, would prevent the negroes from accusing when really they had been injured; but I never found a case of the kind.

Every night, it was my driver's business to enquire of me what I would have done the next day. Although, he frequently had his duties allotted to him for a week ahead, he was nevertheless required to do this regularly every evening. He was also at the same time required to report the work of the day ended. It will be asked what was the necessity of all this, when I superintended every thing that was done myself? I answer, it gave the driver a habit of regularity, and prepared him for a proper discharge of his duties, should I be sick. The more the driver is kept aloof from the negroes, the better. The truth is, he cannot maintain too much pride in his conduct towards them. Once let them believe that they are his equals, and all control is lost.

I have said so much about the driver, that I have little room to speak of the negroes. Their proper management constitutes the chief success of the planter. If he has not a proper control of them, he had much better give up planting; for as sure as he continues, they will ruin him.

Having laid down rules for the regulation of your plantation, the first consideration is the study of the character of your negroes. This will not take you long to do; in one month the full character of very slave you superintend might be learnt. For the breach of every rule, *certainty of punishment* is every thing. If a negro is permitted to go once unpunished for a fault, he will at any time afterwards do the same, and risk being flogged. I have always discovered that where the overseer is *positive*, that the negroes are better disciplined, more mildly treated, and consequently more happy; once, however, a negro has been punished, the fault should be overlooked, and his spirits should not be broken down by continually reminding him of his past misconduct. Not observing this rule, has very often ruined some of the very best negroes. I have frequently met with negroes, whom the whip would ruin, with whom a little flattery could do every thing. I will state an instance of the kind. Ten years ago, I bought, at auction in Charleston, a stubborn, ill looking fellow, sold as runaway. Upon examination, I found that he had the marks of having been repeatedly whipped. I asked the fellow the reason of this, he said it was because he could not do his work. I was convinced that Ben, (for that was his name) had not been properly managed. I accordingly purchased him, at a reduced price, took him home, and put him to work by the side of some of my best workers. I pointed out what I would require of him; and in a flattering way, observed to the other fellows, that I was now going to give them a push. "Now," said I, "Ben, I will expect you to do your best; keep close to those fellows, and if you follow them up close, you may feel proud of yourself." He seemed pleased at my remark, said he would, and commenced as if he intended to do his best. I left Ben to himself, and in a few hours after returned to where he was working: he was getting on exceedingly well, for which I complimented him. It was in this manner that I urged him on throughout his day's work. That evening he finished his task, did it well, and went home much pleased with himself. This was the first step towards the reformation of Ben. By following up my treatment, I so entirely reclaimed him in a few months, that from being a runaway and rogue, I made him one of my primest and trustiest negroes.

*Order* should be strictly maintained among negroes. By this, I mean order, in their occupations and duties. Once or twice in the month, I made it my business to visit each negro house; I examined every thing therein; saw that the negroes permitted no dirt or filth to be collected about them, and as invariably punished them where I

found they had done so, as if they had omitted to do their day's work. This plan of supervising your negro houses, works wonderful effects upon your plantation. It keeps your negroes cleanly and healthy; and prevents the concealment of all kind of roguery. If every overseer would follow this plan, I am convinced that there would be little use for patrol laws.

I not only attended to the negroes in the cleanliness of their houses, but I also, enjoined the strictest observance as to the cleanliness of their dress. If negroes are left to themselves, they will, generally speaking, pay little attention to their dress. I have seen them on some plantations almost naked from suffering their clothes to remain unmended. This can easily be remedied. Make it a rule to oblige every negro, to have his clothes mended as soon as you discover them broken; and if your force be large, have some old person to serve as "general mender" to the plantation, and you will never have to insult the eye with a set of ragged negroes.

Next, to making your negroes attend to the orderly arrangement of their houses, and dress, you should oblige them to attend also to that of every thing about the plantation. I obliged every negro on the plantation to superintend every thing in its place that he finds displaced. If, for instance, a negro passes a fence that has been put down; if a rail has been thrown from its place, it is his business to replace it, or to inform the proper person whose business it is to do so. This rule I followed when I was a poor man, working at a salary of five hundred dollars a year; now that I can drive my chair, I stick to the rule still. I believe that a great portion of my success in life depended upon this simple rule, which was first taught me by my employer. I was riding out with him, a short time after coming to oversee for him; he happened to pass by a fence where one of the bars had been left down, by which means the cattle had got into the oats patch. His coachman had passed by the fence in that condition once before that morning. Mr. ———, upon his return home had his coachman punished. It was in vain that he said in extenuation of his conduct, that he had not observed the bar; it should have been observed by him, as well as by his master; so he was punished. Though I lived fifteen years for Mr. ———, I never knew his coachman to be punished for the same thing a second time. Some persons might have thought Mr. ——— severe for punishing a fault so apparently trifling; but as I have before observed, it is by the punishment of small faults that large ones are prevented.

Negroes should in no instance be permitted to *trade*, except with their masters. By permitting them to leave the plantation with the view of selling and buying, more is lost by the owner than he is generally aware of of. Let each planter have upon his place, a store of such articles as his slaves usually purchase elsewhere. These can be dealt out to them for their corn and such things as they have to sell. By so doing, your negroes will be better and more cheaply provided; and be put out of the way of the temptation to roguery.*

I hold out every inducement to the negroes to marry among themselves on the plantation; thus giving them no cause for leaving their homes. Whenever my employer could do so, he always purchased the families of any negro he might own, assigning the reason I have already given.

But, Mr. Editor, I must conclude: I have already trespassed upon your patience too long. You will accept my crude reflections, as they are intended, for the benefit of overseers, who have, as I have had once, to commence. Should you desire to have from me, more particularity, be pleased to interrogate me, as to the points upon which you desire information; and I shall endeavor to answer your queries.

Not wishing to intrude my humble name upon the public, I subscribe myself with great respect,

AN OVERSEER.

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From the Farmer and Gardener.

### AMERICAN OIL WELL.

About ten years since, whilst boring for salt water near Burkesville, Ky, after penetrating through solid rock upwards of 200 feet, a fountain of pure oil was struck, which was thrown up in a continued stream more than 12 feet above the surface of the earth. Although in quantity somewhat abated, after the discharge of the first few minutes, during which it was supposed to emit 75 gallons in less than a minute, it still continued to flow for several days successively. The well being on the margin, and near the mouth of a small creek emptying into Cumberland river, the oil soon found its way thither, and for a long time covered its surface. Some gentlemen below, curious to ascertain whether the oil would take fire, applied a torch: quick as a flash, was exhibited the astonishing spectacle of the surface of the river in a blaze, which soon climbed the most elevated cliffs, and scorched the summit of the loftiest trees, to the no small discomfiture of some of the neighbours. It ignites freely, and produces a flame as brilliant as gas. Its qualities were unknown, but a quantity was barrelled, most of which soon leaked out. It is so penetrating as to be difficult to confine in a wooden vessel, and has so much gas as frequently to burst bottles when filled and tightly corked. The color is green, but upon exposure to the air assumes a greenish hue. It is extremely volatile, has a strong pungent, and indescribable smell, and tastes much like the heart of pitch pine. For a short time after the discovery, a small quantity of the oil would flow whilst pumping the salt water, which led to the impression that it could always be drawn by pumping. But all subsequent attemps to obtain it, except by a spontaneous flow, have entirely failed. There have been two spontaneous flows within the last six years. The last commenced on the 4th day of July 1835, and continued about six weeks, during which time 20 bbls. of oil were obtained. The oil and the salt water with which it is invariably combined during these flows, are forced up into the pump, supposed by the gas, above 200 feet, and thence through the spout into a covered trough, where the water soon becomes disengaged and settles at the bottom, whilst the oil is readily skimmed from the surface. A rumbling noise resembling distant thunder, uniformly attends the flowing of the oil, whilst the gas

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* Upon the plantation of Winbon Lawton, Esq. of James-Island, this plan has been adopted. The consequence is, Mr. Lawton's negroes are considered as among the most orderly and best disciplined on the Island.—*Editor.*

which is there visible every day at the top of the pump, leads the passing stranger to inquire whether the well is on fire.

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From the Cultivator.

### CULTIVATION AND HARVESTING OF INDIAN CORN.

All, or nearly all, the accounts we have published of great products of Indian corn, agree in two particulars, viz. in not using the plough in the after culture, and in not earthing, or but very slightly, the hills. These results go to demonstrate, that the entire roots are essential to the vigor of the crop; and that roots, to enable them to perform their functions as nature designed, must be near the surface. If the roots are severed with the plough, in dressing the crop, the plants are deprived of a portion of their nourishment; and if they are buried deep, by hilling, the plant is partially exhausted in throwing out a new set near the surface, where alone they can perform all their offices. There is another material advantage in this mode of cultivating the corn crop—it saves a vast deal of manual labor. See the communication of Mr. Tomlinson, in to-day's paper.*

There is another question, of interest to farmers, which relates to the mode of harvesting the crop; that is, whether it is best to top the stalks, cut the whole at the ground when the grain is glazed, or cut the whole when the grain has fully ripened. We have stated the experiments of Mr. Clark, of Northampton,† one of the best practical farmers of our country, and of other gentlemen, showing, that the grain suffers a diminution of six or eight bushels the acre, by topping the stalks; and there seems to be no counterbalancing benefit in the fodder. unless at the expense of carrying the stalks to the borders of the field, that they may be secured before the crop is gathered, and before they become blanched and half ruined. And it is no protection against early autumnal frosts, but rather exposes unripened grain to be more injured. Hence, so far as regards these two modes, all who have made a comparison, seem to concur in the opinion, that stripping the corn of its tops and leaves, is a bad practice. William Carmichael, of Maryland, has given us, in the Farmers' Register, his experiments in this matter, which go to corroborate the conclusion we have drawn. He took, promiscuously, one hundred ears from corn that had been topped, and one hundred ears from that which had not been topped, growing side by side. The first weighed, on the cob, 50 pounds; shelled, 41 pounds, and measured 21 quarts, 1 pint. The other on the cob, 54 pounds; shelled, 46—and measured 26 quarts—showing a difference of nearly one-fifth in favor of the unstripped or untopped corn. The fact is, that topping not only prevents the further elaboration of the sap, which can only take place in the leaves, and which is necessary for the growth of the corn, but it deprives the grain of much that is already elaborated, and on its way to the grain. If a fruit tree is deprived of its leaves, before the fruit has attained its growth, or mature flavor, the fruit will no longer grow, nor will it attain high flavor, for its supply of elaborated food, or vegetable blood, is cut off by the loss of leaves. We have noticed this particularly in the plum. Satisfactory experiments have not been made to determine, whether it is most advantageous to cut the crop when the grain is merely glazed, or to wait till it is perfectly ripe. This will depend upon the amount of loss, if any, in the grain, by early harvesting—the relative value of the grain and fodder—and the prospect of both being injured by early frosts—for neither are liable to suffer from frost after the crop has been cut and put into shooks. It is to be noticed, that, in early cutting, the stalks are succulent, and abound in elaborated sap on its descent from the leaves to the grain, and that this supply of food to the grain continues to flow probably for some days after the corn is in shook, and if so, the grain itself continues to improve, though we think it likely that the crop undergoes some trifling diminution. But if frost is likely to intervene, before the complete maturity of the crop, there is no doubt but the corn will suffer less in shook than it will standing, while the fodder will be materially injured by frost. Admitting that there is a small loss in grain by early cutting, though it is undoubtedly less than when it is topped, the difference in the value of the fodder, under the two modes of management, is vastly in faver of early harvesting. We do not pretend to calculate to a nicety, the difference in nutritous properties of corn stalks cut in a succulent state, early in September, well cured and well housed, and those left standing till October or November in the field, but we should think it fifty per cent. Well cured corn stalks afford an excellent winter food for neat cattle; and when fodder is likely to be in demand, they may be made to contribute largely to the profits of the farm. Several of our acquaintance have kept their neat stock almost entirely upon this fodder during the past winter, and we have done the like, having first cut ours in a cutting machine; and so far as we can learn, the cattle kept upon them are in excellent condition.

The preceding considerations justify us in recommending, that in the management of the Indian corn crop, the following rules be observed, at least partially, so far as to test their correctness:

1. That the corn harrow and cultivator be substituted for the plough in the culture of the crop.
2. That the plants be not hilled, or but slightly so—this not to prevent the soil being often stirred and kept clean. And,
3. That in harvesting, the crop be cut at the ground as soon as the grain is glazed. Ed. Cult.

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"The two last years, corn has been raised in the following manner, on the Mohawk Flats, near this city. If in grass, the land is ploughed and well harrowed, lengthwise of the furrow, without disturbing the sward. The ground is then prepared for planting, by being marked out two and half feet one way, and three feet the other. The last season, the field was rolled after being planted, with evident benefit, as it made it level. When the corn is three inches high, the cultivator is passed through both ways: and twice afterwards

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* An extract from the piece referred to will follow this. Ed. Far. Reg.

† Published also in the Farmers' Register, p. 243. vol. II.

it is used in the same manner; no hills are made, but the ground is kept level. Neither hand hoe, nor plough are used, after the corn is planted. Fields, manured with coarse manure, have been tilled in the same manner. Corn, tilled in this way, is as clean of weeds, as when tilled in the usual way; it is no more liable to be blown down, and the produce is equally good. It saves a great deal of hand labor, which is an expensive item in the usual culture of corn. Last October, ten rods were measured out, in two different places, in a corn-field, on grass land—the one yielded ten, the other nine bushels of ears. In one corn-field, after the last dressing in July, timothy and clover seed were sown, and, in the fall, the grass appeared to have taken as well as it had done in adjoining fields where it had been sown with oats." * * * * *

CHARLES H. TOMLINSON.

### NICOTINE.

Mr. Davy described some experiments which he had made in reference to the relative values of Virginian and Irish tobacco. He procured nicotine by simply digesting the leaves in potash, and then distilling. A liquid, possessing uniform qualities, passed over. The liquid is acted on by acids, affording salts possessing a sharp biting taste. The effect of the liquid was tried upon different animals, and found to be highly narcotic. He found that one pound of Virginian tobacco was equivalent to two and one-third of Irish tobacco; the root containing four or five per cent. of nicotine. The usual estimate of the relative values, is as one to two.—*Arcana of Science.*

### TRIFOLIUM INCARNATUM.

The cultivation of this plant is, we are glad to hear, spreading rapidly; and it is in some parts of the country very generally taking the place of tares, as it produces a much greater quantity of food, and does not require much more than a tenth of the labor bestowed in preparing the ground and sowing it. It also comes in a fortnight earlier. *Loudon's Gardener's Magazine.*

### TENNESSEE LAND AND FARMING—LIMESTONE—LIME—LUCERNE.

*Columbia, Maury County, Ten.*
*May* 4, 1836.

To the Editor of the Farmers' Register.

* * * * * *

I have, thus far, been very much pleased with the Register. I hope it will continue to be as interesting as it has been. It might, perhaps, be rendered more acceptable to your patrons in this section, if you would devote more space to cotton, stock, and grass. Our climate and soil are well suited to those subjects, and they engross the chief attention of our agriculturists. We are not much of a wheat-growing people. Our climate does not suit it. It freezes out of the ground in the winter.

While I am writing, I will call your attention to an article in your last number, of much importance, but which I do not sufficiently understand, and which I will thank you to explain. In the essay, translated from the *Annales de l' Agriculture Française*, page 743, is described a sure remedy for smut in wheat. In describing the quantity of lime and of sulphate of soda, the terms "*hectogrammes, kilogrammes, hectolitre,*" are used, which are not sufficiently explained to a person who cannot "*parlez vous.*" I will thank you to give them a more definite exposition in English measures. One other subject I will thank you to give us all the information about, you can obtain, which is of great importance to this country, and that is the use of lime as a manure or improver of soils. This is a limestone country. We have it in great abundance, and no other kind of stone. But how to use it on our lands, in what quantities, and how to tell whether our soils require such improvement, we do not know. Perhaps you may be able to give us some plain directions in the particulars. If you can, it will be very acceptable.

I have but little experience in farming, as I have but lately turned my attention to it. I will mention an experiment I commenced last year, with lucerne. I sowed about one-third of an acre near my stables last spring, in April, in drills two feet apart. I commenced cutting it in September, and cut it three times before frost. I have now cut it nearly over the first time this season, and where I began first to cut it, it is as high as when I first began. I work eight plough horses and mules, and have four other horses that do not work, and four milk cows. I give them all a full feed of it every day, and they cannot consume it near so fast as it grows. I find it very valuable. It requires but little labor to cultivate it, and contributes greatly to the health of my work horses. * * * *

[The several articles on lime and calcareous manures, recently given in this journal, will serve, it is hoped, to furnish much of the information on that head, desired by our correspondent. If he had been a reader of the earlier volumes, he would have seen that much space has been there given to the subject of live stock, and their management: and that more has *not* been given, and of information more especially suited to the western breeders of cattle, is owing to the circumstance, that, *from their pens*, this journal has received scarcely any aid. Let them commence to write—to commmuuicate ever so little that they *know* of what is useful, in each particular case—and to inquire for the much more abundant supply of information that each writer may *need*—and it may be relied on, that the scarcity in this particular department of our journal will no longer be a matter to complain of. If a subscriber is anxious to *read*, and to *learn*, on any particular subject, we advise him forthwith to *write* on it, as the best means to attain his object speedily and effectually. In this manner, our respected correspondent may help himself, and at the same time greatly help the Farmers' Register.

With regard to the explanation of foreign weights and measures, we have given it generally, and also in reference to particular casas, in several different parts of this journal. (as at p. 505, vol. 2, p. 745, vol. 3, &c., &c.) Still, as it may not be always convenient to refer to such foregone explanations, a convenient abridged statement will be now annexed.]

### FRENCH WEIGHTS AND MEASURES, COMPARED WITH ENGLISH OR AMERICAN.

One metre is equal to 3.2809167 English or American feet, nearly three and three-tenths—or three feet and eleven lines, or 3.078444 of the ancient French measure.

From the *metre*, the fundamental measure, all others are formed, either by multiplying or dividing by tens: thus, in measures of length—

| | | |
|---|---|---|
| A Deca-metre is equal to | 10 | times the metre. |
| Hecto-metre do | 100 | do |
| Kilo-metre do | 1000 | do |
| Myria-metre do | 10,000 | do |
| Deci-metre is the | 10th | part of a metre. |
| Centi-metre is the | 100th | do |
| Milli-metre is the | 1000th | do |

The same prefixed syllables, attached to any other measures, in like manner, designate a similar increase or decrease of amount, always by tens.

The following are some of the French weights and measures, most commonly mentioned, with their equivalents given in English and American, in whole numbers and decimals.

*Linear measures.*

| French | English or American feet. |
|---|---|
| Metre, (as above,) equal to | 3.2809167 |
| Deca-metre | 32.809167 |
| Hecto-metre | 328.09167 |
| Kilo-metre | 3280.9167 |
| | **Inches.** |
| Deci-metre. | 3.9371 |
| Centi-metre | 0.39371 |
| Milli-metre | 0.039371 |

*Square, or land measures,*

| | Square feet English. |
|---|---|
| Centi-are, (or square metre,) equal to | 10.7644143923 |
| Deci-are | 107.644143923 |
| Are | 1076.44143923 |
| Hect-are (100 ares) | 107644.143923, or 2.473614 English acres, or nearly $2\frac{1}{2}$. |

*Measures of Capacity.*

The unit, both for liquid and dry measure, is the *litre* which is equal to a cubic *deci-metre*, or 1.760773 English pints, or not quite $1\frac{8}{10}$. The Winchester bushel, (the English and American measure,) contains $2150\frac{3}{5}$ English cubic inches.

| French. | English or American. | Cubic inches. |
|---|---|---|
| Litre, (as above,) equal to | 61.028 | or pints, 1.760773 |
| Deca-litre | 610.28 | or gals. 2.2009667 |
| Hecto-litre | 6102·8 | or gals. 22.009667 |

*Weights.*

| | | |
|---|---|---|
| The gramme is equal to | 15·438 | grains Troy. |
| Kilo-gramme | 2.68027 | pounds Troy. |
| | or, 2.20548 | pounds avoirdupois |

A more full list of French weights and measures, and an account of the plan of their arrangements, may be seen at p. 505 to 508, Vol. III.

## REPORT ON THE SURVEYS FOR THE CITY POINT RAIL ROAD.

*To Messrs. G. W. Harrison, A. B. Spooner, J. D. Townes, Patrick Durkin, William Robertson, E. James, and John A. Peterson, Commissioners under the Act of Assembly, incorporating the City Point Rail Road Company.*

The following report of a survey made by your order, is respectfully submitted.

After an examination of the country, between Petersburg and City Point, two routes presented themselves, and as the decision of the question of preference between them, may involve considerations of private interest, it was thought most prudent and advisable to survey and report both, and leave the decision of the question of preference to those most interested.

When we speak of two routes, it is not to be understood, that there are two separate and distinct routes throughout the entire line. From the topographical features of the country upon the line of the contemplated improvement, it was found that a portion of the distance intermediate between the extremes, admitted of being selected as a route common to both lines. This, it will at once be perceived, naturally divides our work into three parts. The first division extends from Petersburg to a point about one half mile east of Mr. Peyton Mason's house, where the two lines unite; from which point, the common line, which forms the second division, preserves a perfectly straight course, to a point within one mile of City Point, very near the forks of the road leading from that place. The portion from this point, for the sake of convenience of reference, may be called the third division. With these preliminary explanations, we can now proceed with greater facility to a more particular description of the two lines of the survey.

For the sake of distinction, I have called the two routes by the names of the northern and southern routes.

We will now commence with the northern route, which begins at Bollingbrook Street, and continues along the margin of the Appomattox River, to the lower end of the plantation of A. B. Spooner, Esq.—from thence, it pursues a straight line through the flat lands of Mr. Nath. Friend, Mrs. Jordan, and Mr. Knox, and ascends the ridge, by a branch to the left of Mr. Peyton Mason's, where it curves gently to the right for one half mile, and from thence, pursues a perfectly straight line to City Point, and communicates with the river at the steamboat wharf. Upon this northern route, there need not be an inclination greater than 20 feet per mile, and but four curves, of a radius exceeding two thousand feet each.

The southern line commences at the depot of the Petersburg and Roanoke rail road, and passing along in the street leading from the same, crosses the run between Petersburg and Blandford, and continuing on in the same straight line, leaving the New Market race course to the left hand, crosses Skipper's run—here the line ascends the ridge by following a hollow or ravine near to, and lying southward of Mr. Nathl. Friend's house, by an inclination of 25 feet per mile. From this place, it is a straight line to where it joins the former line at the point already designated. From this to the other point, one mile from City Point, designated as the termination of the second division, the two lines are common to both surveys. From this last point, it curves to the right, and communicates with the James River at a point 3500 feet below the communication of the other line with the river.

The following statements, in tabular form, will show the undulations, or grades of ascent or descent of the two lines, which are remarkably favorable to the application of locomotive engines, as is also the direct course those lines pursue.

*Northern line beginning at Bollingbrook Street.*

| No of Sections. | | Length of the sections in feet. | Total ascent or descent in the section in feet. | Length of a position of the line corresponding to an ascent or descent of 1 foot. | No. of feet ascent or descent per mile. |
|---|---|---|---|---|---|
| 1 | Descent | 5,220 | 3,00 | 1740 | 3,03 |
| 2 | Ascent | 5,560 | 24,00 | 231 | 22,38 |
| 3 | Descent | 1,540 | 1,00 | 1540 | 3,42 |
| 4 | Ascent | 10,600 | 53,00 | 200 | 26,40 |
| 5 | Descent | 3,590 | 8,00 | 448 | 11,76 |
| 6 | Ascent | 2,560 | 5,00 | 512 | 10,31 |
| 7 | Level | 1,450 | | | |
| 8 | Descent | 6,630 | 31,00 | 214 | 24,68 |
| 9 | Ascent | I,360 | 4,00 | 340 | 15,52 |
| 10 | Descent | 4,750 | 11,00 | 431 | 12,22 |
| 11 | " | 2,900 | 10,00 | 294 | 17,95 |
| 12 | Level | 2,773 | | | |

*Southern line beginning at the Depot of the Petersburg and Roanoke Rail Road.*

| No. of Sections. | | Length of the section in feet. | Total ascent or descent on the section in feet. | Length of a portion of the line corresponding to ascent or descent of 1 foot. | Number of feet ascent or descent per mile. |
|---|---|---|---|---|---|
| 1 | Descent | 2690 | 12.00 | 224 | 23,55 |
| 2 | Ascent | 7150 | 5,00 | 1430 | 3,69 |
| 3 | " | 6021 | 34,00 | 177 | 29,81 |
| 4 | " | 2680 | 5,00 | 536 | 9,85 |
| 5 | Descent | 5600 | 17,00 | 329 | 16,02 |
| 6 | Ascent | 420 | 2,00 | 210 | 25,14 |
| 7 | Descent | 3490 | 8,00 | 436 | 12,10 |
| 8 | Ascent | 2560 | 5,00 | 512 | 10,31 |
| 9 | Level | 1450 | | | |
| 11 | Descent | 6530 | 31,00 | 210 | 25,06 |
| 10 | Ascent | 1360 | 4,00 | 340 | 15,52 |
| 12 | Descent | 4010 | 10,05 | 381 | 13,82 |
| 13 | " | 2480 | 9,00 | 275 | 19,16 |
| 14 | Ascent | 3800 | 2,00 | 1900 | 2,77 |

| | Miles. | Yards. |
|---|---|---|
| The distance in a right line from Bollingbrook st. to City Point, | 8 | 1335 |
| The distance in a right line from Petersburg and Roanoke rail road depot to City Point, is | 9 | 445 |
| Length of the northern line | 9 | 484 |
| Length of the southern line | 9 | 907 |

From which it does appear that the northern line exceeds a right line between its two extremes by 907 yards.

And the southern line exceeds a right line between its two extremes, by 462 yards.

And that the southern line exceeds the northern line by 403 yards.

*Estimate of the cost of the two lines are as follows:*

NORTHERN LINE.

| | |
|---|---|
| 138,752 cubic yards of excavation, at 12½ cts. per yard | $17,344 00 |
| 184,811 cubic yards of embankment, at 15 cents per yard | 27,726 60 |
| 1,284 cubic yards of masonry, at $5 per yard | 6,420 00 |
| 850 cubic yards of masonry for culverts, at $3 per yard | 2,550 00 |
| 800 cubic feet for dry walling, at $2 50 cts. per yard | 2,000 00 |
| Three miles of grubbing, at $300 per mile | 900 00 |
| Nine miles, 1453 feet of superstructure, at $4,000 per mile | 37,101 08 |
| | $94,041 68 |

SOUTHERN LINE.

| | |
|---|---|
| 170,942 cubic yards excavation, at 12½ cents per yard | $21,367 75 |
| 44,500 cubic yards embankment, at 20 cts. per yard | 8,900 00 |
| 113,759 cubic yards embankment, at 15 cents per yard | 17,063 85 |
| 1,800 cubic yards masonry, at $5 per yard | 9,000 00 |
| 1,000 cubic yards for culverts, at $3 per yard | 3,000 00 |
| Four miles grubbing, at $300 per mile | 1,200 00 |
| Nine miles 2721 feet superstructure, at $4,000 per mile | 38,061 76 |
| | $98,593 36 |

The following estimate of machinery and fixtures is to be regarded at the least with which the Company could conveniently commence operations with any degree of efficiency; after which, the increase of business upon the road will indicate the necessity of a gradual increase in the quantity of machinery.

| | |
|---|---|
| 2 locomotive steam engines, at $6,000 each | $12,000 |
| 12 passenger cars, at $750 each | 9,000 |
| 20 burden cars, with springs, at $300 each | 6,000 |
| And for depots at each end of the road, say $5,000 each, | 10,000 |
| | $37,000 |

Before closing this report, I think it proper to remark, that in case it should be determined to approach the James River at the lower point, I am of opinion that an improvement in the line might be effected by a change of the route more southerly, which would aviod some deep excavation through a ridge at the corner of Weston fields. The estimates submitted comprehend a proper allowance for contingencies. I herewith hand a map of the survey.

JOHN COUTY,
*Civil Engineer.*

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For the Farmers' Register.

## SURPLUS REVENUE.

There is no subject which at present seems to command a larger share of the public attention than that of our surplus revenue. The immense moral and political influence which an overflowing treasury is likely to exert throughout the whole extent of our wide-spread territory, is a matter of too palpable and striking a nature to escape the public view. The consequences of this character are really alarming, and calculated to inspire the patriot with serious apprehensions for the continuance of that virtue and political integrity in our people, which Montesquieu has but too truly asserted to be the vital principle of republicanism. I have not taken up my pen, however, to portray these effects. Others, far abler than myself, with all the power of their eloquence to sustain them, have forced the public mind into contemplation of the subject under this particular aspect. Besides, an agricultural journal is not, perhaps, the proper receptacle for discussions of this character.

There is one view, however, of this important subject, (of a politico-economical character,) which seems, as yet, to have made no serious impression on the public, though certainly I think of the highest moment. It is this: *that a large surplus revenue must necessarily keep the whole monetary system of our country in a constantly unsteady and deranged condition; and this, too, in spite even of all the efforts of government to prevent it.*

The *modus operandi* is easily explained. Every one at all acquainted with the complicated concerns of trade, knows the vast importance of the currency to the harmony of all its operations, and at the same time, the extreme sensitiveness of this important portion of the capital to every thing which affects either its quantity or the velocity of its circulation. Of all the parts of the currency, none is more important than the *money*. This is peculiarly important as a general measurer of value throughout the country. Now, that which increases or diminishes its quantity, all other things remaining the same, must necessarily raise or depress prices, and a continuanee of such vacillation as this, throws the country into the utmost confusion and disorder, and seriously deranges all the operations of trade.

Our surplus revenue does, and must *inevitably* continue, to produce such disorder and vacillation as I have just spoken of. Mr. Gallatin, some years ago, estimated the money in actual circulation in our country at about $120,000,000. Now, suppose our surplus revenue to be $40,000,000, and of course, liable to be collected in money. Here, then, we have the government in possession of one-third of all the money in the country. Suppose that government should suddenly collect the whole of this revenue, and lock it up, if you please, in the strong boxes of the treasury, what would

be the consequence? Why, one-third of the money is suddenly abstracted from the circulation, and the consequence would be a pressure in the money market, as sudden and terrible as an earthquake. Destroy one-third the corn, wheat, or meat, now in use, and we all know what would be the dreadful result. This abstraction of the currency is precisely equivalent to a destruction of one-third of the money of the country as long as it is withheld from the circulation. How would this pressure be relieved? By gradual importation of specie from abroad, and by gradual extension of bank issues, until the deficit occasioned by the abstraction of $40,000,000, was supplied, and the trading community were again in possession of $120,000,000, the sum necessary for the functions of circulation. Suppose, now, the government should determine to disburse the money, no matter in what manner, which has been for a time withdrawn, what would be the effect? You would then have the money of the country suddenly raised to $160,000,000—$40,000,000 beyond the usual amount. The effect of this would be, a sudden elevation of prices, soon followed by a rage for speculation, finally to be cured by large and extravagant importations from abroad, which would create a money balance against us, and drain us of specie, and force a system of curtailment on the entire banking system throughout the country. In the mean time, the accumulation of another surplus would force the country through the same melancholy routine of grinding pressure and bloated prosperity, equally hostile to a pure and sound state of morals, and to a steady and constant accumulation of wealth. But I have said this effect would be produced by a large surplus revenue, *in spite* even of all the efforts of government to prevent it. In our country, the revenue is deposited in certain banks chosen for the purpose; and where the revenue annually collected is annually disbursed, there is no danger of a pressure from this cause, because the deposites of the government are made and withdrawn with some degree of regularity, and the deposite banks can easily conform their operations to those of the government without any detriment to the public. But when a surplus revenue of $40,000,000 is deposited in a certain number of banks, the case is far, very far different. The expenditure of such a revenue is a very uncertain event. It may be demanded of the banks tomorrow, or it may not be for years. To-day, Congress is not in session, and there is no danger of an appropriation. The consequence will be, that the deposite banks will enlarge their issues, and flood the country with paper. To-morrow, Congress is convened, and apprehension is entertained that this enormous surplus may be called for. The consequence is, the deposite banks must place themselves in a position of safety; they must curtail their issues; gather together their funds in order that they may be ready to obey the summons of the government. This curtailment, on the part of the deposite banks, forces a similar line of policy on the others, and hence a money pressure. After a short time, Congress either appropriates the money, or rises without any action on the subject. In either case, the currency will again become suddenly expanded, because of the restoration to the circulation of that portion, so long held in a state of inactivity to meet the public calls.

The great pressure now felt in the large cities, is an exemplification of the views here submitted, and shows, most conclusively, that while Congress *involuntarily* holds suspended the sword of Damocles over the deposite banks, they must and will produce a money pressure, and a consequent derangement of the whole monetary system. Nothing but a guarantee that the money will not be called for without years of notice in advance, can possibly prevent these disastrous fluctuations in the currency of our country, as long as we have a large surplus revenue constituting so very considerable a portion of the circulating medium.

This tremendous, and I may truly say, most awful influence over the whole trade and prosperity of the country, exerted by the mere existence of a great surplus revenue, is one of those overwhelming evils which statesmen scarce dream of before they happen. I do not recollect ever to have heard or seen one single prediction of any such calamity as this, from an overflowing treasury. And even now I do not think our statesmen seem sufficiently impressed with the deleterious influence of our surplus upon the whole monetary system. In fact, if this view of the subject has been presented to the public at all, it has not met my eye. Now, when we consider that the surplus will increase for several years to come, and that if our government shall be as economical in its expenditures as it ought to be, the surplus may amount, before 1842, to a sum equal to all the money requisite to perform the functions of circulation in this country, the most vivid imagination can scarce conceive the disastrous consequences of such an accumulated treasure. The value of every item of property in the whole country will depend "upon the hazard of a die." The sudden hoarding on the part of the deposite banks to meet the calls of government, would instantly paralyze the whole business of the country, and inflict a death-like torper on all the operations of commerce. The sudden abstraction of so much money from circulation would at one blow annihilate all exchangeable value, and leave debtors every where at the mercy of creditors. A sudden restoration, after such an abstraction, would again restore the currency, raise prices, blow up the bubble of speculation to burst once more with the same melancholy consequences. When we take into consideration, that the construction of turnpikes, rail roads, canals, the building of factories, and the forming of joint stock schemes throughout the country, are rapidly increasing the amount of stocks; that all these stocks are exceedingly sensitive to all the fluctuations in the money market, rising to-day and falling to-morrow; that these fluctuations in the stock market generate a gambling spirit, at once destructive of the morals and religion of the country, and fatal to the formation of those steady and persevering habits of industry which alone can insure the steady accumulation of national wealth. We cannot but the more lament the existence of a great surplus revenue, which must, of necessity, increase immeasurably all these evils. These fluctuations are not matters of chance, or the result of intentional oppression by the government; they are the necessary and inevitable results of the surplus revenue. Distributions of such revenue regularly among the states, seems to be the only remedy left, if the tariff compromise of 1832 is to be con-

sidered as sacred and inviolable. That would not perhaps be found a complete remedy, but it is certainly the best that has yet been offered.

If ever the Congress of the U. States was called upon to settle a difficult and momentous subject, it is this subject of the surplus revenue. I wish that every man in the United States could be made to see the truth, that the whole property of the country is involved in this question of the surplus revenue. If it is suffered to advance until it absorbs all the money of the country, the value of every house, of every foot of land, of every species of produce and property, will be at the mercy of these fluctuations, occasioned by the contractions and expansions of the currency caused by the existence of an overgrown surplus revenue. And all this will happen, whether the government should wish to oppress or not. The power of the government becomes most fearfully great, with a large accumulated revenue, and the best government in the world, with such a fund, becomes like Ahmed, the Pilgrim of Love, in the *Tales of the Alhambra*, when cased in the enchanted armour, and mounted upon the enchanted steed: an impetus was given to him which drove him furiously against friend and foe, in spite of every effort to restrain himself, until he had prostrated in universal ruin all who lay before him.

I hope this, my hasty sketch of the influence of the surplus revenue, will at least have the effect of calling public attention to the subject.

Z. W.

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From the Athenæum.

### RAILWAYS IN PROGRESS IN ENGLAND.

Under the head of railways now in progress of construction, we find several schemes surpassing in magnitude any that have hitherto been accomplished. Our notice of these must be confined to the most important: the review of which will most appropriately commence at the southern extremity of the great line, proceeding from the shores of the channel to the north of Lancashire, with the *London and Southampton* railway. This line proceeds from Southampton, passing near Winchester and Basingstoke, to the north of Guildford, by Wimbledon, to Vauxhall, London, a distance little short of 75 miles; for which, the estimate was, as far as we can remember, 1,000,000*l.* From the excessive difficulties of the country, and the consequent heaviness of the works, we should be inclined to suppose it will probably require at least 2,000,000*l.* for its completion. The Act of Parliament was obtained in 1834.

A project, under the name of the *Great Western* Railway, for connecting London with Bath and Bristol, a distance, by the proposed line, of about 120 miles, with an estimate of 2.500,000*l.*, was first entertained two years ago. The eastern termination is on the Birmingham line, about 4 miles from the station in London. The Act was obtained in the session of 1835, after a contest of almost unexampled severity; and we perceive that the works, some of which are heavy, including a long tunnel on an inclined plane at Box, are in progress.

The next in succession, northward, is the *London and Birmingham* Railway, passing by the valley of the Brent, Watford, Berkhampstead, Fenny Stratford, near Northampton, Daventry, Rugby, and Coventry, to Birmingham, a distance of 111½ miles. The estimate for this line, which, from the nature of the district traversed, must be expensive, is two millions and a half; and the whole distance will, probably, be completed in the course of the year 1838. The works are proceeding with great activity, and, at each end of the line, a certain number of miles will be opened this year, as we learn. There will be several tunnels required to carry the line through the different ridges that cross its course: one of these, at Watford, will exceed a mile in length: an objectionable, but, it is said, inevitable feature of this railway—the chief dependence of which must, of course, be on passengers. By this means, however, good levels have been secured, and the distance will easily be performed in five hours and a half.

From Birmingham, the line is continued northward by the *Grand Junction* Railway, proceeding from the London Railway by Wolverhampton,* Penkridge, Stafford, to the west of Newcastle and the Potteries, through Cheshire, to Warrington; at which point it takes up a branch railway already made, and pursues it to Newton, a point on the Liverpool and Manchester Railway, equidistant from these towns. The total length, including the Warrington and Newton line, is about 82 miles; the estimate of its cost, 1,100,000*l.*: it will probably require, including the expenses of a carrying establishment, a million and a half. The district traversed, presents, in general, fewer obstacles than are met with on the London line, and will require no tunnels; there are, however, some works of great magnitude at different points, among which may be named the great viaduct across the valley of the Weaver, in Cheshire, consisting of twenty arches, of sixty feet span, and more than sixty feet above the level of the valley. The works are rapidly advancing, and the road, it is expected, will be opened, throughout its entire length, in the summer of 1837. About four hours will be occupied in traversing it.

At Newton, another branch line, formerly known as the Wigan Railway, has been incorporated with one at present in progress, which will complete the entire distance of 21 miles, from Newton to Preston, under the title of the *North Union* Railway. The cost of this, including the improvements which must be made in the Wigan and and Newton division, will not be much less than 500,000*l.*: the works have already made some progress, and will, it is expected, be completed in 1838. There are a few heavy excavations on the line, and a viaduct, now building across the valley of the Ribble, at Penwortham, which will be a handsome but expensive work.

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* It is intended to carry this railway over the valley of the rivers Tow and Ouse at Wolverhampton, by a viaduct consisting of 6 elliptical arches, each of 60 feet span, with piers of 10 feet thickness. The arches will spring at about 21 feet 6 inches above the general level of the ground, and the line of the surface of the rails will be about 49 feet above the same surface: the width between the parapets will be 20 feet clear. The abutments will be finished in front with pilasters; the wings will have arched openings, and the extremities of the wings will be finished with pilasters. The rivers will be turned under the arches in a paved channel.

We find, at the northern end of the North Union Railway, the *Preston and Wyre* Railway, for which an Act of Parliament was obtained last year. It is connected with a proposed extension of the Harbour of Wyre, at the southern side of Lancaster Bay, where, it is hoped, a port of some consequence may spring up: the distance may be about five miles. This short link completes the communication between our northern and southern waters—a length of nearly 300 miles, the expenditure on which will exceed six millions sterling.

Returning to London, we discover, at the foot of London Bridge, the commencement of the *London and Greenwich* Railway; a singular work, conducted, throughout its whole length of $3\frac{3}{4}$ miles, on a succession of irregular arches, the ground below being already appropriated. The number of these arches will be from 900 to 1,000, averaging 22 feet in height from the ground; the longest structure of the kind, we believe, in the kingdom. The estimate is 400,000*l.*; the works were begun in 1834, and are now far advanced.

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From Loudon's Gardener's Magazine.

### A TREE DAHLIA.

In the beginning of August, 1835, I went to Liverpool. At the old botanic garden there I saw an arborescent dahlia growing: it is a cutting, resembling a middle-sized trunk, or small stem, of an elder birch, as thick as one's leg, and fully as woody as the elder. The plant is said to grow forty feet high in Mexico. It was throwing out leaves very like those of our herbaceous species.

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From the London Mechanics' Magazine.

### SUGAR FROM INDIAN CORN.

M. Pallas lately presented to the Academie des Sciences of Paris a sample of this substance, extracted from the stem of the plant, which has been found to contain nearly 6 per cent. of sirop boiled to 40 degrees, a part of which will not crystallize before fructification; but it condenses and acquires more consistency from that period to the state of complete maturity. The most favorable time to obtain the greatest quantity of sugar, is immediately after the maturity and gathering of the fruit. The matter left after the extraction of the sugar, is capital to feed cattle, or to make packing paper.

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From Burnett's Botany.

### NATURAL HISTORY OF RICE.

The rice, (oryza sativa,) if estimated by the proportion of food it contributes to the sustenance of man, is the most valuable of all the grasses, and perhaps the most useful vegetable grown; as the unnumbered millions of the east are supported almost wholly on this corn, for the growth of which the extensive swamps of those hot countries, and their unrivalled means of irrigation, are so peculiarly adapted. Rice is the staple corn of the tropics, as the oat is of the northern, and wheat of the temperate regions. The culture of rice is an exceedingly unhealthy occupation; for the frequent flooding of the fields keeps them constantly in a swampy state, and favours the production of malaria. Rice has been raised in England on the banks of the Thames, a crop having been once tried and gathered in near Windsor. In Italy it is cultivated with success; but artificial irrigation has been carried there to a higher degree of perfection than in any other part of Europe. Still it shrinks into insignificance if compared to the gigantic labors of the east, as will appear from the following account.

Between the fort of Nundydroog and the rising ground on which we stopped to view the prospect, there extended a valley some six or eight miles across, the whole bottom of which was marked with a succession of artificial tanks, used for irrigating myriads of rice fields lying below the level of these reservoirs.

The table-land of Mysore, which is several thousand feet above the level of the sea, is not strictly a flat plain, as the name would imply; neither is it mountainous, nor even very hilly: and yet the surface is extremely uneven, being moulded into gently sloping ridges, which form between them a succession of long valleys slightly inclined, broad and shallow, and winding about in all directions. Across almost every one of these valleys, the natives have thrown embankments, some of them of very ancient date, though some of them are even so recent as the dynasty of Hyder. These walls, or *bunds* as they are called, are made of considerable strength, and when they are small generally curve upwards, so as to offer the convex side to the pressure of the water; but if they be a mile, or several miles in length, the embankments assume a waving snake-like shape; I suppose from some idea of strength. One valley was pointed out to me about a mile broad and forty miles long, from end to end; this included between thirty and forty tanks, some large and some small, every square yard of the intermediate space between the bunds being richly cultivated, while the surrounding country appeared to be condemned to nearly perennial sterility. I believe that the whole rice crop of Mysore is derived from irrigation.

This vast supply of water is gained partly by the method of the tanks just described, and partly by tapping the Cauvery and other rivers by means of subaqueous dams built, during the dry season, diagonally across the bed of the stream. The effects of these dams is to direct a portion of the river into lateral trenches, stretching far and wide over the country. From these it is again drawn off to water the rice fields. I remember hearing a traveller describe the mode in which the great river Indus is tapped or drawn off in this manner, to the right and left, for the purposes of agriculture, until the unhappy stream is fairly exhausted, and its channel left dry. One is so much accustomed to consider the mighty mass of water, forming a river of any magnitude, as something beyond the power of man to control, that it requires good evidence to satisfy our credulity on this point. But if the Indus, in the districts alluded to, resemble the Mississippi and many other streams flowing over extensive alluvial countries, there need be no difficulty in conceding such a transfer of the whole of its waters, from the ordinary bed of the stream to the fields on either side; because rivers which traverse deltas almost invariably flow along the summits of ridges somewhat higher than the adjacent country. These ridges, it is true, are so wide and flat, that their elevation, at most places, can scarcely be detected by the eye; but still the

inclination of their sides is abundantly sufficient to admit of water draining away from, instead of flowing towards, the river.

But as such rivers are liable to overflow their banks during the rainy season, it becomes necessary, in order to prevent the country being inundated, to raise walls or embankments to confine the streams. These being raised a little higher than the surface of the river at its highest, confine the stream within proper limits. But as the floods of each successive year bring down a prodigious mass of gravel and sand, the wear and tear of the mountains, fields, and forests, through which the tributary streams have passed, a certain portion of the largest and heaviest of these materials must subside, and remain at the bottom when the river reaches the low grounds, where its rate of motion is much diminished. This addition, though it be small in any one year, gradually raises the bed of the river. If this rise were not carefully met by a corresponding annual elevation of the artificial embankment, it is obvious that the water, in the course of time, would periodically overflow, and inundate the country. The consequence of these alternate struggles between the waters trying to escape, and man insisting on confining them, has been to lift the whole body of the Cauvery, in its passage across the Carnatic, several feet above the highest level of the surrounding country. The supply of water so curiously raised into the air, is exclusively appropriated to the irrigation of the country.

In the upper lands of Mysore, the peasants are dependent chiefly on their tanks for moisture, as the rains are uncertain in quantity, and transient in their effects. The stock of water collected in these numberless and extensive tanks, many of which well deserve the name of lakes, is capable of being distributed to the precise quantity and at the precise times required. I have been often amused at observing with what scrupulous care the persons appointed to distribute the water, let it off from these magnificent reservoirs. The thirsty soil of the Mysore, parched and riven by heat, drinks up the fluid with a kind of relish—a sort of animated enjoyment, at which I was never tired of looking.

In describing things which lie so much out of the ordinary course of observation, one becomes sensible of the poverty of language. Thus the word tank suggests, to most people, the idea of a common cistern attached to a dwelling house, and filled with rain water from pipes along the roof. The word pond, again, recalls images of muddy water, draggled post horses, rank weeds, and a combined fleet of ducks and geese engaged in common warfare against frogs and worms. To call the tanks of Mysore by the name of lakes would be near the mark, for many of them well deserve that appellation. The *Moota Talou*, or rich tank, for example, near Seringapatam, I understand, is nearly thirty miles in circumference. I never saw that particular sheet of water, but many of the artificial lakes which I did examine, measured six, eight, and ten miles round; and so vast are their numbers, that I remember counting considerably more than one hundred at one view from the top of Nundydroog; nor do I believe that the least of them could have been less than two or three miles in circuit.

Dr. Buchanan, in his journey through those countries, made by order of Lord Wellesley, in 1800, shortly after the capture of Seringapatam, describes minutely the formation of these tanks. The Saymbrumbacum Tank, not far from Madras, he says, is eight miles in length by three in width, and is sufficient to supply with water the lands of thirty-two villages for eighteen months, supposing the usual rains to fail.

Rice being a water plant, renders these extensive means of irrigation absolutely necessary. The ground requires to be moistened before it can be stirred to receive the seed. When sown, it is roughly covered, trodden in by the feet of cattle driven forward and backwards over the field. When sown, the ground is immediately flooded, and during its growth is never suffered to be dry till it is ripe. The thrashing floor is a circular trench sunk on a dry spot near the field. Into this the crop is thrown as it is brought from the field, and as soon as there is a layer four or five feet thick, three or four bullocks or buffaloes are led in, and driven round and round upon the straw incessantly till the whole crop has been trodden, or until the cattle can no longer be kept in the trench. The straw is then shaken out and removed; and the grain is found in the bottom of the trench mixed with chaff, stones, and earth, which causes a great deal of labor in winnowing, to get it fit for use or market. The grain, when thus freed from the straw, is called paddy, and after being shelled by the action of a large pestle and mortar, is then fit for use under the name of rice. It is cooked by plain boiling, and eaten with the fingers. Salt is always added; and those who can afford it flavor it with spices.

Rice is imported in large quantities into this country, both from the East Indies and America. The Carolina rice is said to be the produce of a small bag, given as a present, by Dubois, the treasurer of the East India Company, to a Carolina trader; and in 1698 sixty tons were sent home. Upwards of 100,000 bags of rice are now annually imported, and the quantity is gradually increasing.

The Canada rice, *Zizania fluitans*, although not yet much cultivated, has all the natural capabilities to become a valuable corn. Its grains are large, and replete with a fine bland farina or meal. It grows abundantly in the shallow waters of North America, and has been acclimated here: it grows freely both in Middlesex and Rosshire. Attempts are being made, which, it is to be hoped, will be successful, to cultivate it in Ireland. Pinkerton says, "this plant seems to be designed by nature to become the bread corn of the North."

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From the West of England Journal.

### VICTORIA WHEAT.

Experiments have lately been made in the island of Jamaica, under the scientific auspices o the philanthropic Dr. Bancroft, with wheat sent by Sir Robert Kerr Porter, first to England, from Caraccas, and thence to Jamaica, the results of which experiments are stated as follows:

"The Jamaica Agricultural and Horticultural Society have received samples from three or four different places, of the wheat produced there, all of which appear to be of a favorable sort.

"First, from the mountains of St. Anne's, where the seed had been *sown the latter end of January*,

and the corn *was ripe the latter end of April.* In another part of the same district, the dates of sowing differed from the above, but the wheat ripened in nearly the same period.

"Next from the mountains of St. Andrew's. On one property, Fair Hill, (about 2,000 feet above the sea) the sowing and the ripening happened at the same dates as in the first mentioned case. Of this corn, *one grain* produced *twenty-eight ears*, containing altogether *fifteen hundred grains*, (being an average of fifty-three grains for each ear.) Notwithstanding this apparent success, the proprietor of the place thinks it unlikely that planters would grow the Victoria Wheat in preference to the *Great Corn*, as it is called here, i. e. *Zea Mays*. On another plantation again, Charlottenberg, (about 4,000 feet above the level of the sea,) the seed was sown early in March, and received a top dressing: in the course of a few days it had already sprung up three inches above ground; and, as favorable moderate ruins continued to fall subsequently, the corn throve well, and ripened in the early part of June, producing abundantly, grain of a larger size than the parent seed; the ears being large and full. Six of these, for instance, yielded *three hundred and thirty-six grains, weighing three ounces, making an average of fifty-six grains, weighing half an ounce*, to each ear. Mr. W. B. King, an assistant Judge of Assize, and member of Assembly, has since sent me two bundles of the ears of his wheat, and I intend to inclose one or two of them as a specimen of the produce of the Victoria wheat here. From the trial just made, Mr. King has no doubt that this grain could be cultivated in many parts of this island, and that it might become a profitable resource."

The wheat which was the subject of these experiments, was of that kind cultivated in the environs of La Victoria and San Matheo, spoken of by Humboldt, in the fourth volume of his Personal Narrative, as being sown there in the month of December, and the harvest reaped on the seventieth or seventy-fifth day, an interval corresponding with singular accuracy with the account given above by Dr. Bancroft. Of this wheat Humboldt says, that its grain is large, white, and abounding in gluten; having a thinner and softer pellicle than that of the wheat raised on the cold table lands of Mexico. He states the produce of an acre *(arpent des eaux et forets*, or legal acre of France, of which 1.95 make an hectare, being equal to about one acre and a quarter English,) as amounting usually from three thousand to three thousand two hundred pounds weight, being at the rate, for an English acre, of from two thousand one hundred and sixty, to two thousand five hundred and sixty pounds; the growth of what we may conclude to be an alluvial soil, from what Humboldt says, at page 101, of the aspect of the situation of Victoria, the approach to which was marked by the ground becoming smoother, and looking like the bottom of a lake, the waters of which had been drained off, while the neighboring hills, only one hundred and forty toises in height, were composed of calcareous tufa; their abrupt declivities projecting like promontories into the plain, and seeming by their form to indicate the ancient shore of the lake. The elevation of the cultivated ground is fixed by Humboldt at from 270 to 300 toises (about 1726.51, to 1918.35 English feet) above the level of the sea, an elevation from 81.65 to 273.49 English feet below that of Fair Hill, in the mountains of St. Andrews, Jamaica, where a single grain yielded, from twenty-eight ears, a return of fifteen hundred for one.

The seed was obtained direct from Caraccas, where Sir Robert Kerr Porter procured it from the place of its growth, and was transmitted a second time across the Atlantic, to Dr. Bancroft; hence no doubt can be entertained of its being the genuine wheat spoken of by the illustrious traveller from Prussia.

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### COMMERCIAL REPORT.

The commercial transactions of the present month have exhibited little activity, and there has been a decline in almost every article of foreign or domestic produce. If no other cause existed to produce these effects, the pressure for money might be adduced as quite sufficient. Without any important change in foreign markets, ours (which had been higher than those warranted,) have declined to rates more nearly proportioned to those markets, and are still such as amply to remunerate the grower.

Tobacco commands $5 to $11, not including the extreme rates of the worst and the fancy qualities. Cotton 15 to 17 cts.—Flour (country) $6¼.

Bank stocks have declined about 1 per cent., although the period for declaring dividends is nearer at hand, and large ones expected. In rail road and other stocks, there is no variation.

The distribution of the French and Neapolitan indemnities to our citizens for spoliations committed many years ago, will add some millions to the active capital of the country; but the amount is inconsiderable compared with that which has accumulated in the depositories of the national treasury, the expenditure of which to nseful purposes, or its distribution, is anxiously desired by many.

To what extent the disturbances with the Indian tribes on the southern frontier may affect agriculture, and consequently, commerce, remains to be ascertained. X.

*May* 25.

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### THE SILK BUSINESS BEGINNING IN PETERSBURG.

A company has been very recently made up in this place to begin the business of mulberry and silk culture, as soon as the proper season arrives; and from our knowledge of the individuals who have commenced this enterprise, we can safely predict, that there will be nothing wanting to insure success, if zeal, energy, intelligence, and the investment of sufficient capital can command it. We rejoice most heartily in this movement—and consider it as the germ of future results of incalculable value to this region,. In all our many efforts, made through this publication, to urge the commencement and zealous prosecution of silk culture in Virginia, we have not pretended to have any personal knowledge of the particulars of the business, or the grounds on which to estimate profits. But we have assumed this general position, which we think cannot be shaken—*that if silk culture is profitable in New England,* (as it undoubtedly is,) *much more pro-*

*fitable must it be, in lower and middle Virginia.* We have superior advantages, (for this purpose,) to our northern brethren, in our warmer climate and longer summers—the very low prices of lands—and also in a large amount of labor, altogether suitable, and which yields nothing for other purposes. Lands in the central region, exhausted and hilly, but well suited for the growth of the mulberry, may be now bought at $2 or $3 the acre. For land of much less value for silk culture, the silk companies of the north seldom pay less than $100 the acre. So great is the difference in these respects, that we have long entertained the opinion, that by far the best course that a northern silk company could take, would be to establish its operations on a large scale on lands in Virginia.

There is an establishment already existing in Petersburg, which is admirably suited to be devoted in part to raising silk. This is the Poor House Farm. This establishment is unusually well regulated, and has already every thing necessary to carry on the silk business on a large scale, except the mulberry trees, and a cheap additional building for a cocoonery. There is enough and good land to plant—plenty of suitable labor, there being usually 30 or more young or infirm paupers, most of whom are fully competent to attend to this light work, and whom it is impossible now to employ, profitably, if at all; and moreover, there is already existing, that constant and excellent supervision and strict attention, which is indispensable to the success of the silk business, and which it would be both costly and difficult to obtain for a new establishment. Nor would the adoption of this suggestion create a rival to the silk company just formed. On the contrary, every like experiment would serve to aid and increase the lights, and to lessen, by sharing the losses, caused by inexperience, of every other new establishment. There is no danger of overstocking the silk market, even if silk was cultivated on every farm in Virginia, between the falls of the rivers and the mountains.

In all the Northern states, individuals and societies are every where going into the silk business. Many and large capitals are already invested—and every week there are annunciations of other new undertakings. No one there expresses even a doubt of the success and profit of the business: and it should be remembered that silk culture has already been carried on profitably for more than half a century in Connecticut.

Wherever the white mulberry tree grows, (no matter of what color the fruit may be,) proprietors ought to save the seeds of the present crop, as largely as possible. There can be no crop planted that will yield more profit, for sale, than the young trees, unless it be of the still more valuable Chinese mulberry. The white mulberry grows abundantly along the shores and banks of James River, and probably on all our tide waters.

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### PECULIAR ADVANTAGES OF VIRGINIA IN AGRICULTURAL PRODUCTS.

To the Editor of the Farmers' Register.

* * * * Virginia possesses some agricultural advantages peculiar to her position. So much of the eastern half as is favorable to wheat, (and all the soil may be made favorable,) produces that grain in the greatest perfection, and of which the flour is the best suited for preservation and use in tropical climates; and no wheat can now be advantageously raised further south, in the tide-water region of the United States. For the latter reason, our wheat is the earliest matured that can possibly reach the Northern Atlantic cities—consequently, nature gives us a monopoly of the best markets for this product, and which are yearly and rapidly increasing in their demand. Another advantage we share with our adjacent sister States. It is, that owing to the nature and varied times of our harvests, our land can never be visited by the horrors of famine—which no degree of fertility of soil, or of industry of the cultivators, can elsewhere always guard against. In the greater part of Europe, and in many other countries, all the great crops for the food of man, are matured nearly at the same time; and a very destructive season for one of them, is likely to injure all, in a considerable degree. A general failure, or great deficiency of crops, is therefore not a very rare event—and when such scarcity occurs, an entire year must pass before another harvest can bring relief. Hence, under such circumstances, no amount of national wealth, and no foreign aid whatever, can prevent famine in a populous country, if even one-third of the usual means for subsistence should be wanting. Here, our most abundant crop, Indian corn, is fully matured at the commencement of cold weather, and its consumption is not generally begun sooner. But if previous scarcity require, its use for food may be commenced two or three months earlier. Our wheat and other small grain crops are reaped early in summer—and by enlarging the seeding, they may be increased to any desirable extent beyond their usual quantity, if required by the deficiency of the previous crop of corn. The value of this security against famine, is not the less a blessing, because we have not appreciated it, and have scarcely imagined the possibility of the occurrence of such miseries as often afflict other nations. * * * *

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From the New England Farmer.

### ATLANTIC SILK COMPANY.

*Extract of a letter from Col. Gardener, of Nantucket.*

We shall commence manufacturing silk goods in two or three weeks. We have one invoice of India and one of Naples silk on hand, and we are daily expecting an invoice from Smyrna, and have also sent orders for a large amount, which will arrive in the country in July, or the first of August next. We have had a piece of handkerchiefs sent us from the Spitalsfields weavers, and we trust before long to have the pleasure of exhibiting it in Boston with a piece of *Nantucket*, made from precisely the same stock. In the mean time individuals have commenced setting trees on their own account. I shall put on my farm this spring about eighteen thousand trees, including about

twenty-five hundred of the Morus Multicaulis. My friend, S. B. Tuck, will set about as many more. We have no doubt at all of the success of the Morus Multicaulis, but we have found it impossible to procure them at any price. As many of our white mulberries are small, our present intention is to engraft them another year.

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### TO READERS AND CORRESPONDENTS.

Owing to a combination and succession of losses and mishaps in the printing department of our business, (a department of which we have been compelled, and with as much reluctance as unfitness, to assume the personal and immediate direction,) the May No. was not issued until the 12th, instead of the 1st of May; and to make up for the lost time, and to return to the usual and regular time of issue, it was necessary to print the present No. in half the usual time. This will, *in part*, serve to account for the circumstances that No. 1, which was six weeks in going throngh the press, was very largely supplied with original matter, and No. 2 has a supply unusually small. But it is *only in part*, that this explanation serves—for, in truth, the aid of our correspondents is furnished very irregularly; and it has so happened that there has been but little received within the last month. It is hoped that this cessation is but temporary—caused, probably, by the recent fine and growing weather, which has given to every farmer abundant and interesting employment in his fields; and that, from all such persons, the Farmers' Register will, at least, have the benefit of some of the leisure time afforded by rainy days in summer, and the long and tedious nights of winter. In the meantime, we are persuaded that the present offering of original matter will not be found deficient except in *quantity*—and the defect, in that respect, has permitted the insertion of some long and interesting selections, which, otherwise, would necessarily have been deferred, or excluded.

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### ERRATUM.

To the Editor of the Farmers' Register.

If I am not mistaken, you have omitted a part of my communication, which appears in the first number of Vol. IV of the Farmers' Register, viz. "I beg leave to bring before your readers, an old theory on the generation of plants," &c. The omission would induce the reader to believe the theory advanced to be one of my own, which is not the fact. The theory and opinions are drawn from Richard Bradley's old treatise on gardening, published more than a century past.

GALEN.

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